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## THE INSECTS OF ANCIENT AMERICA.

BY S. H. SCUDDER.

Until within a very few years not more than four or five kinds of fossil insects had been found on this continent. Indeed, little thought had been bestowed upon their possible discovery, and while hundreds of eager students had carefully examined the living insects, few turned to the ancient representatives of this class upon the globe. New and interesting discoveries have thrown some light upon the insect-life of Ancient America, but even now, the known species, occurring in many localities and in various deposits, will not number one hundred different kinds.

The discovery of the oldest insect remains in the world is due to Mr. C. F. Hartt. While collecting fossil plants in the Devonian slates near St. John, New Brunswick, he first perceived faint traces of insects' wings. Few persons would have noticed these insignificant relics, but Mr. Hartt having discovered a single insect, thoroughly examined all his rock specimens until six other fossils were brought to light. In the more carefully gleaned fields of

Europe, a few species have been found as low down as the Carboniferous rocks of Wetterau, Saarbrück, etc., but these fossils from the Upper Devonian carry the first appearance of insect-life back to a previous epoch, and make their advent in North America synchronous with that of land plants.

The specimens obtained by Mr. Hartt are intrinsically interesting; although they are all fragments, broken generally from the centre of the wing, enough distinctive parts remain to determine the character of the fossils. They are all Neuroptera, or Lace-winged flies, and, with the exception of one or two Ephemerina, or May-flies, represent families which are now extinct. One of them is provided with a few veins forming concentric rings near the base of the wing; these rings bear such a striking resemblance to the stridulating organ of the green grasshoppers, that I am inclined to believe there were chirping Neuroptera in those days!

Similar in interest are some specimens of Neuroptera from the Carboniferous beds of Morris, Illinois; they occurred in small flattened iron-stone concretions, like the clay-stones in clay banks of the present day. These Neuroptera also represent families distinct from any now living, and, like many of the Devonian insects, are synthetic in character; that is, combine in one and the same form features which, in after ages, are distributed among the members of different families. In this case the synthesis unites families belonging to different sections,—some to Neuroptera proper, others to Pseudo-neuroptera. The Neuroptera proper include those families where the pupæ are inactive, and the limbs are folded against the body; such as the Sialina, Hemerobina, Mantispadæ, Panorpina, and Phryganina (Caddis-flies). In the Pseu-

do-neuroptera—classed by some naturalists with Orthoptera—the pupæ are active and are provided with rudimentary wings; otherwise they differ but little from the larvæ: among them are the Termitina (white ants), Psocina, Perlina, Ephemerina (May-flies), and Odonata (Dragon-flies). Had these insects of former days active or inactive pupæ?

Two other remains were found in these iron-stone concretions; they appear to me to be those of worms, but naturalists have described one form as a centipede, the other as a caterpillar of a moth; the caterpillar was referred to the family of Arctians, to which our woolly caterpillars belong. The last, if true, would be a most interesting discovery; for in Europe only one moth, and that of the lowest family, the Tineids (of which the clothes-moth is a member), has been found as low down as the Jurassic period.

Dr. Dawson, of Montreal, has been quite fortunate in discovering various kinds of insects in the coal-beds of New Brunswick and Nova Scotia; traces of the mining of larvæ were found on the leaf of a fossil fern, and this was the more remarkable because ferns in our day are peculiarly exempt from attack by mining insects. Among the fossil remains were numerous fragments of Myriapods, which had secreted themselves in the trunks of decayed trees; coprolites of the reptiles which had sought shelter in the hollow trunks proved that the animals fed partially, at least, upon insects,—they were filled with comminuted fragments of the bodies and limbs of Orthoptera and Neuroptera of large size, and, in one instance, Dr. Dawson found the eye of a dragon-fly.

Professor Marsh, of New Haven, has also obtained an insect's wing at the Joggins in Nova Scotia; he thought

it similar to a cockroach's wing found by Professor Lesquereux in the Carboniferous rocks of Frog Bayou, Arkansas, but it was put away at the time of its collection, and has never since been examined. Mr. Barnes has just discovered a wing of a similar kind in the coal formation of Pictou. There has been but one other instance—and that of very recent date—where a fossil insect has been found in the Carboniferous rocks of this country; it was the case of a single wing, gigantic in size, peculiarly veined, and probably allied to our May-flies, which occurred in the coal-beds of Cape Breton, Nova Scotia.

Professor Hitchcock, in his examination of the footprints in the New-Red Sandstone of the Connecticut Valley, described and figured some small tracks which he supposed to have been made by insects; but the footprints of insects have been little studied, and the whole subject is so difficult in its nature, that it would be an arduous task to prove whether the tracks were made by insects or not. In the shales accompanying the New-Red Sandstone, however, quite a large number of insect remains have been found, all of which belong to the larva of a single species. Professor Hitchcock believed them to be neuropterous, but I think they should be referred to the Coleoptera, or beetles. The species must have lived in the water, since the specimens are comparatively numerous; on a small slab I have counted more than twenty individuals.

Professor William Denton has obtained the largest collection of fossil insects which has yet been made in this country. The specimens were brought from an uninhabited region beyond the Rocky Mountains, near the junction of the White and Green Rivers, Colorado,—a deposit probably far richer than that of Œningen, in Switzerland. Professor Denton was able to obtain but

few specimens while passing rapidly through the country, but he describes the shales in which they occur as a thousand feet thick, varying in color from a light cream to inky blackness, and crowded with the remains of insects and leaves of deciduous trees. Between sixty and seventy species of insects were brought home, representing nearly all the different orders; about two-thirds of the species were flies,—some of them the perfect insect, others the maggot-like larvæ,—but, in no instance, did both imago and larva of the same insect occur. The greater part of the beetles were quite small; there were three or four kinds of Homoptera (allied to the tree-hoppers), ants of two different genera, and a poorly preserved moth. Perhaps a minute Thrips, belonging to a group which has never been found fossil in any part of the world, is of the greatest interest. At the present day, these tiny and almost microscopic insects live among the petals of flowers, and one species is supposed by some entomologists to be injurious to the wheat; others believe that they congregate in the wheat, as well as in the flowers, in the hope of finding food in the still smaller and more helpless insects which congregate there. It is astonishing that an insect so delicate and insignificant in size can be so perfectly preserved on these stones; in the best specimens the body is crushed and displaced, yet the wings remain uninjured, and every hair of their broad, but microscopic fringe, can be counted.

The specimens came from two localities about sixty miles apart, called by Professor Denton Chagrin Valley and Fossil Cañon; these two faunas are apparently quite distinct: the ants, the moth, the thrips, nearly all the small beetles and the greater part of the flies come from Fossil Cañon, while the larvæ are restricted to Chagrin Valley.

While no definite conclusion can be drawn concerning the age of the rocks in which these remains occur, there can be little doubt that they belong to the Tertiary epoch. Professor Denton believes them to be at least as old as the Miocene.

The species of fossil insects now known from North America, number eighty-one: six of these belong to the Devonian, nine to the Carboniferous, one to the Triassic, and sixty-five to the Tertiary epochs. The Hymenoptera, Homoptera, and Diptera occur only in the Tertiaries; the same is true of the Lepidoptera, if we exclude the Morris specimen, and of the Coleoptera, with one Triassic exception. The Orthoptera and Myriapods are restricted to the Carboniferous, while the Neuroptera occur both in the Devonian and Carboniferous formations. No fossil spiders have yet been found in America.

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EXPLANATION OF PLATE 16.

Fig. 1. *Miamia Bronsoni.* A neuropterous insect found in ironstone concretions in the Carboniferous beds at Morris, Illinois. The figure is magnified one-third, and has all its parts restored; the dotted lines indicate the parts not existing on the stone. Reduced from a figure in the Memoirs of the Boston Society of Natural History, Vol. I.

Fig. 2. *Archimylacris Acadica.* Wing of a Cockroach observed by Mr. Barnes in the coal-formation of Nova Scotia.

Fig. 3. *Platephemera antiqua.* A gigantic May-fly obtained by Mr. Hartt in the Devonian rocks of New Brunswick.

Fig. 4. *Xylobius sigillariæ.* The Myriapod (or Gally-worm) found in the coal-formation of Nova Scotia, by Dr. J. W. Dawson. Copied from a figure in Dr. Dawson's Air-breathers of the Coal-period. Magnified.

Fig. 5. *Lithentomum Hartii.* A neuropterous insect, the specimen first discovered by Mr. Hartt in the Devonian rocks of New Brunswick. This fossil, and those accompanying it, are the oldest insect-remains in the world.

Fig. 6. Three facets from the eye of an insect, considered by Dr. Dawson a Dragon-fly. It was found in coprolites of reptiles in the

Fig. 1.

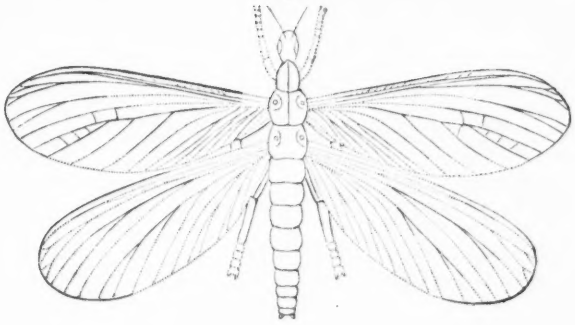


Fig. 2.

Fig. 3.

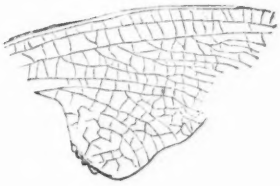


Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

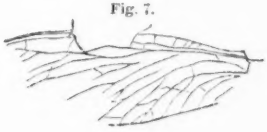
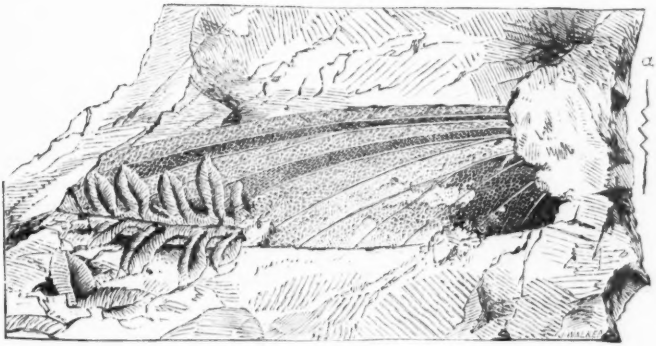


Fig. 8.




SCUDDER ON FOSSIL INSECTS.

rocks containing the myriapod, represented in Fig. 4. Copied from Dr. Dawson's figure, greatly magnified.

Fig. 7. *Homothetus fossilis.* A neuropterous insect from the Devonian rocks of New Brunswick; it was discovered by Mr. Hartt.

Fig. 8. *Hyplophlebium Barnesii.* A curious neuropterous insect, of large size, probably allied to our May-flies; taken by Mr. Barnes from the coal of Cape Breton.

These figures, with the exception of 1, 4, and 6, are of life size, and borrowed from the new edition of Dr. Dawson's Acadian Geology.

## THE HAND AS AN UNRULY MEMBER.

BY BURT G. WILDER, M. D.

(Concluded from page 491.)

*Fracture or Crossing.* This is the name given to a view of the limbs, which, under various modifications, has been entertained by four celebrated anatomists, Bourgery, Cruveilhier, Flourens, and Owen. Its essential feature is the pronation of the forearm so as to bring the thumb on the inner side, opposite the great toe; but this has the effect of crossing the radius upon the ulna, so that its upper end is to the outer, while its lower end is to the inner side of that bone. This condition of things, though contrary to the relation of the corresponding parts in the leg, is accepted by Owen* and Flourens, who simply seek to show that the front of the arm really corresponds to the front of the leg, and *vice versa*, so that the concavity of the elbow is made to represent the convexity of the knee; but the other two anatomists try to explain the crossing of the bones, upon an idea which was distinctly enunciated by Cruveilhier, in the following propositions:

"1. Neither bone of the leg is represented by a single bone of the arm.

*Comparative Anatomy of Vertebrates, ii. 310, 360.

"2. In each bone of the leg we find characters which belong, partly to the ulna, and partly to the radius."

The practical result of this view is to cut the two bones across the middle, and reunite the upper half of the one with the lower half of the other; a convenient and ingenious, but unjustifiable mode of procedure.

Fig. 1.


*Torsion.* This last of the three principal theories adopted, or rather invented, in support of the idea of parallelism, was first proposed by Maclise, in 1849. Like all the rest, he assumes that the thumb corresponds with the great toe; that the hand points forward like the foot, and that the limbs are, or ought to be, parallel: but he saw that his predecessors had been unable to fulfil these three conditions without pronating the hand, and so crossing the radius upon the ulna, which crossing he could not reconcile with the fact, that the corresponding bones in the leg (Plate 12, fig. 1)* were parallel with each other. He then perceives that the *front* of the forearm really corresponds with the *back* of the leg, and *vice versa;* whereas, according to the idea of parallelism, the front of the one ought to correspond with the front of the other, as believed by Owen and Flourens. To reconcile this new fact with the old theories, he reminds us that "anatomists have long since remarked upon the singular *twisted* form of the humerus," and then says, "this

*Fig. 1. The right arm as it appears after having been *untwisted*, as proposed by Maclise and Martins. The bend of the elbow is brought to the front, and the two bones of the forearm are parallel. This is in the effort to bring corresponding points of the two limbs to face in the *same* direction. Compare with Plate 12, Fig. 1. The real *symmetrical* view of the limbs requires simply that the forearm be *supinated*, and the thumb left on the outer side like the little toe.

fact of torsion in the shaft of the humerus I consider as fully explaining the above-mentioned peculiarities which distinguish the upper from the lower member; while (in idea) I untwist the humerus by bringing its back to the front, I at the same time unravel the gordian knot of that problem which has so long existed as a mystery for the homologist."

But, before accepting this ingenious solution of the problem, you may be inclined to ask how it is, that, if the humerus is really twisted, anatomists have never observed and described the various stages of the operation, instead of simply commenting upon the *twisted appearance* of the bone. This very reasonable question is thus answered by a French anatomist, Martins, who in 1857, and apparrently unacquainted with the views of Maclise, proposed this very same theory of torsion.

Martins admits as a "metaphysical difficulty," the fact that the humerus *never undergoes* the actual operation of twisting at all, and that in the earlier stages of growth *not the slightest traces of torsion exist;* but asserts, nevertheless, that "a *virtual* torsion does take place during growth, and that this produces the same effects as if it were real." The chief indication of this is the raised line for the attachment of muscles, which runs obliquely upward, from the outer side of the lower end of the humerus, and is lost upon the posterior surface, giving to the lower part of the bone the *appearance* of having been twisted. But it may be seen that the posterior surface of the thigh bone presents a similar raised line, even more strongly marked, so that there is quite as much reason for untwisting that bone, which would leave matters relatively just as unconformable as at first; and it is well known that both these lines are solely for the attachment

of muscles, that they do not exist in young or feeble individuals, and that in some animals, as in the ant-eater, and even in the horse, they form prominent ridges which can never be accounted for by any twisting of the bones.

There is really a fourth theory of parallelism, modifications of which are entertained by three eminent English anatomists,* and which is, in many respects, the most plausible and the most difficult to refute. According to this view the limbs are supposed to stand out at right angles from the side of the body, the elbow being moved forward and outward, and the knee backward and outward into a position which nearly corresponds with the condition of the limb in many reptiles, and also in the early stages of growth of the higher animals; and in view of the great weight which is now deservedly attached to the facts of embryology, it will be evident that such a view must not be rejected without very good reasons. It will be noticed, too, that this view does little violence to the limbs, although the limbs of mammalia would be placed in rather uncomfortable positions, in order to conform to it. I feel sure, nevertheless, in spite of the apparently natural arguments, and in all deference to its distinguished advocates, that it is based upon a partial consideration of the subject, and I wish that it were possible in this connection to offer my reasons for dissenting therefrom. But it involves so much, and would require a discussion of so many still controverted points, that I should be obliged to present in full the grounds upon which my own opinion is founded, which would far exceed the limits of an article like this.†

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*Huxley, Mivart, and Cleland, before cited.

†Those of my readers who care to learn the views of the anatomists who believe in a symmetrical or antagonistic relation of the limbs are referred to the works of the "Oppositists," already cited in the preceding number, and the following papers by the writer: On Morphology and Teleology, June 3, 1866, Memoirs Boston

And to do this was by no means my object, but simply to give an idea of the trouble which has been given philosophical anatomists by the hand; for, as has been shown, the hand suggests an idea of parallelism which it is very difficult to overlook, so that the majority of those who have treated this subject, have made more or less ingenious attempts to apply the same principle to the upper portions of the limbs.

These various attempts have been briefly, though I think fairly stated. What seem to me their fallacies have been brought more prominently into view and criticised as severely as possible, partly on the abstract ground that a great step in our investigation of truth is the full recognition and rejection of error; and partly, in accordance with the purpose of this paper, to show what strange and widely diverse opinions have been entertained by those who have regarded the Hand in its ordinary position, and with the common estimation of its value.

The space allotted to me will permit only the briefest presentation of the grounds upon which is based the other view, that, namely, of a symmetrical or antagonistic relation between the fore and hind limbs; the principal point is, that instead of beginning with the *hand*, and forcing the rest of the limb to conform to it, we should recognize that the hand is a peripheral organ and subject to variation;* and that its morphological value is by no means equal to its teleological or functional value; and that, finally, the attitude which it has in most animals is

Soc. Nat. Hist., Vol. I. No. 1; On a Cat with supernumerary digits, Proc. Boston Soc. Nat. History, May 16, 1866; and on the Morphological value and relation of the Hand (Abstract of a paper read before the National Academy of Sciences, August 8, 1866), American Jour. of Sciences and Arts, July, 1867.

*No one, so far as I know, has recognized this inverse ratio between the morphological and teleological values of organs. And yet its non-recognition seems to me not only to have blinded the eyes of the Parallelists to the idea of symmetry which underlies the antagonistic relation of the proximal segments of the limbs, but also to have prevented most of the Oppositists from carrying out this idea beyond the elbow.

in consequence of the necessity for the extremities of both pair of limbs to strike the ground so as to propel the body in the *same* direction: but if we begin with the upper parts of the limbs, we shall perceive an idea of *antagonism* which may be easily traced in the hands when they are put in what may be termed their *normal position* (Fig. 2);* and although this brings the thumb on the outer side, and thus opposite the little toe, yet if we recollect that in most animals the thumb is rather *smaller* than the other digits, instead of larger as in man, and that therefore its assumed superiority is really confined within a very narrow limit, we may conclude, when the question comes, Shall the thumb force the arm and the forearm into parallelism, or shall it conform to the idea of antagonism which they suggest, that the latter is the fairer and more philosophical view of the matter.

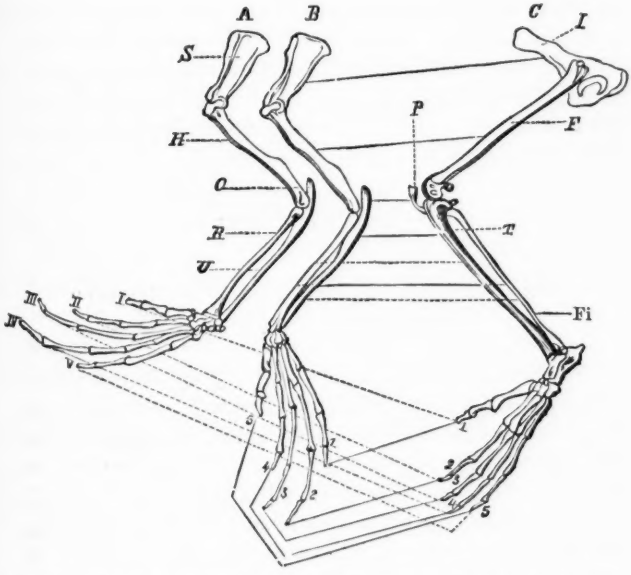
It sums up thus. Begin your studies of the limbs at the periphery, with the hands and the feet, and assume a correspondence of thumb and great toe, you will then see an apparent parallelism as to the extent of which no two investigators can agree, and by which they have been led to twist, to fracture, and to dislocate the limbs in a manner most unjustifiable; and to regard the body as a structure with but one end and no centre, a geometrical absurdity.

But commence at the centre, at the middle of the vertebral column, and regard the body as having not only two *sides* but two *ends*, antagonistic in position and in function; then you will see that the limbs which are given off from the two poles of this longitudinal axis, are like-

*Those of my readers who are unwilling to compare the fore and hind limbs in any other than a *natural attitude*, are reminded that there is no one natural attitude common to all vertebrates, or even to all mammalia, and are referred to what has been said upon the normal position of animals by Professor Agassiz. Contributions to the Natural History of the United States, vol. iii. p. 76.

wise antagonistic in every part but the terminal segments, while even these disagree only in what is the natural attitude of the hand in the forward moving animal, and come into a proper antagonistic relation in what may be con-

Fig. 2.




Limbs of left side of Aye-aye (*Cheiromys Madagascariensis* Cuvier), altered from Owen.* (By permission from American Journal of Science and Arts, July, 1867.) *A*, Foreleg in its *natural attitude*, the hand being more or less pronated, so as to bring the thumb (1) upon the inner border of the limb, and cross the radius upon the ulna. *C*, Hind-leg. *B*, foreleg in its *normal position*, the hand being supinated so as to bring the thumb (5) on the outer side, and opposite the little toe (5). The radius *R* is now wholly on the outer side of the ulna (*U*), and the fingers point backward, as the toes point forward. All the parts are now symmetrical with those of the hind-leg, and the parts thus *symmetrically homologous*, are joined by continuous lines; but the parts which are only *analogous* in the natural attitude of the foreleg, are joined by dotted lines. *S*, Scapula; *I*, Ilium; *H*, Humerus; *F*, Femur; *O*, Olecranon process; *P*, Patella; *U*, Ulna; *T*, Tibia; *R*, Radius; *Fi*, Fibula. The *homologous* digits of *B* and *C* are numbered 1, 2, 3, 4, 5, starting from the so-called little finger and great toe. The Roman numerals attached to the digits of *A* indicate their *analogies* with those of *C*.

* Monograph of the Aye-aye, Plate 7. Also, Comparative Anatomy and Physiology of Vertebrates, Vol. II. Fig. 343.

sidered its normal position. To all this, the thumb is the only objector; but mighty as that is in all matters of common life, you must already have perceived, by a kind of "reductio ad absurdum," that the less it, and, indeed, the whole hand are regarded in our morphological comparison, the less liable shall we be to fall into such extraordinary and fantastic notions as some of those we have been considering. Fortunately, however, man can but interpret Nature; he cannot change her. His errors die with his interpretation, while the facts belong to God, and are safe from the interference of man.

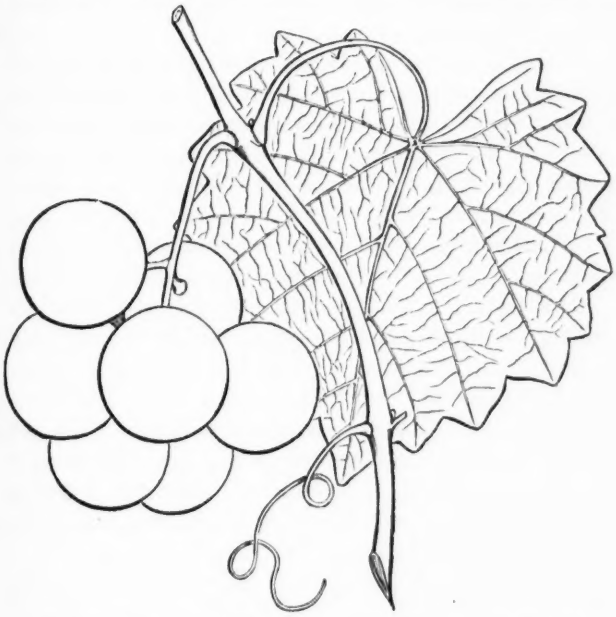
## THE SOUTHERN MUSCADINE GRAPE.

BY D. H. JACQUES.

Climbing the tallest trees, covering and almost smothering the smaller undergrowth, hanging over rail fences, hiding pine stumps and brush-heaps, or, for want of other support, trailing on the ground, one may see almost everywhere in the South, from the seaboard of Georgia and Florida to the mountain slopes of North Carolina, the graceful vines of the Southern Muscadine, and, in its season, the ripened fruit, with which many of these vines are laden, will allure the traveller at every turn from the dusty road. Few who have once eaten this fruit, in its perfection, will be able to resist the temptation to dismount and eat the tempting clusters.

As this grape is not found (I believe) north of the southern slopes of the Alleghany Mountains, and is little known, and often erroneously described, a brief notice of it may not be out of place.

The Southern Muscadine, otherwise called Bullace, Bull, and Bullet-grape is the *Vitis Rotundifolia* of Michaux (*V. Vulpina* Linn.), and is very distinct from all



other species. Its light-brown slender wood, its innumerable small branches, thrown out tree-like rather than in the manner of other grape-vines, and its small, light-green shining leaves, give it a peculiar and singularly beautiful appearance. The following is a correct description of it:—Stem smooth, light-brown dotted with white, lithe, tough, and without pith; branches minutely verrucose, numerous, slender; leaves small, cordate (but somewhat rounded, whence Michaux's name); dentate,

sometimes obscurely three-lobed, glabrous, shining on both surfaces; flowers in racemes, composed of numerous small umbels; polygamous, yellow; berries large, black, musky sweet, with a tough skin; flowers in June; first ripe in September.

The Southern Muscadine produces its fruit in clusters of from three to eight berries, on small branches put out from all parts of the vine, and, if the soil and other conditions be favorable, is often very prolific. The berries vary in size, from half-inch to an inch in diameter. They are brown-black and shining when commencing to ripen, but a dull-black, dotted and sometimes blotched with red when fully ripe. They vary much on different vines, being sometimes hard and sour, but often tender and deliciously sweet. In the best specimens the pulp finally dissolves, and the skins become literally bags of wine. The fruit generally falls from the vine soon after it becomes ripe, but I have seen some vines on which the berries have clung with as much tenacity as in any other species. I have gathered bushels of these grapes during the present season, out of a portion of which I have made some excellent wine.

Professor Asa Gray, in one of his Botanical Text-books (see "Manual of Botany of the Northern United States," page 78), describes the Muscadine as the parent of the *Catawba* and the *Scuppernong*. The former is a variety of the *Vitis Labrusca*, or Northern Fox-grape. In regard to the latter he is correct.

The Scuppernong is a seedling of the Muscadine, and was found growing wild on the banks of the Scuppernong River in North Carolina. The wood is a shade lighter than that of the parent, but dotted like that, and the foliage and habits of growth of the plant are mainly the

same. The fruit is a pale green when fully ripe, and dotted with brown. It is large,—often an inch in diameter,—very sweet, less musky than the common Muscadine, and with a thinner and tenderer skin, and is a delicious table grape. For wine, it is superior to all other native varieties, being emphatically the wine-grape of America. Unlike other cultivated grapes, it is perfectly free from all diseases, no rot or mildew ever infecting wood, leaves, or fruit.

Flower's Grape is a black variety of the same species, and is thought by some to be equal, if not superior, to the white or green variety. It is sweet, juicy, and fragrant, and makes a fine wine of any desired shade of red. It ripens about a month later than the Scuppernong, and does not fall off like that variety. Both are enormously productive, so much so that I hardly dare to state how many bushels of fruit a single vine may bear; but from 2,000 to 3,000 gallons of wine per acre is considered a moderate estimate for a vineyard in full bearing, in which all the arbors are fully covered,—that is, when the whole ground is completely canopied with vines. The vines are planted from twenty to forty feet apart, and trained on arbors made with posts notched on the top, and supporting a layer of common fence-rails. This arbor is extended with the growth of the vine, till the ground is covered. The vines require no pruning, except for the removal of dead branches, or to improve their symmetry. A Scuppernong vineyard is worth a journey from Salem to Savannah to see.

Such is the Muscadine of the South and its offspring.

# A VACATION TRIP TO BRAZIL.

BY C. FRED. HARTT, A. M.

## *New York to Para.*

On the 22d of June, 1867, I left New York in the steamer "Havana" to spend my vacation on the Brazilian coast, my especial object being an exploration of the coral reefs of the vicinity of the Abrolhos Islands, and the study of the geology of such parts of the Province of Bahia as might be accessible to me. Nothing of note occurred on the voyage to the Island of St. Thomas, where the steamer was delayed a day to take in coal, and where I had an opportunity to make a good collection of corals, etc. A long account of my day's examinations having already appeared elsewhere,* I propose in this series of articles to take up my description of some of the more interesting results of my voyage after leaving the West Indies, and to offer a closing article on St. Thomas and the Windward Islands, in which I will incorporate new material collected on my return home.

Steamships have robbed the sea of half its poetry, and a voyage by steam is often very barren in incidents; so with this voyage, we have had no storms, no accident to break the monotony of our life at sea, so that our journals have not been much enriched by any very interesting experiences when out of sight of land. To be sure we have fished up gulf-weed, and collected the delicate little animals found growing on it, and we have watched the flying-fish and porpoises and whales; but one sees about as much of these things from a steamer, as he does of the cattle of a country he travels through by rail.

*N. Y. Tribune, Nov. 7, 1867,—"A Naturalist in the West Indies."

A word about the flying-fish. Of these there are many different kinds, not only belonging to different genera, but different families of fishes. The common flying-fish of the Atlantic belongs to the genus *Exocœtus*, a name given to the Mediterranean species by Aristotle, because it was currently believed by the ancients that the fish, spending the day in the water, flew out at night and slept ashore, whence the name which signifies *a sleeper out*. The common flying-fish somewhat resembles a pickerel, with a squarish head and body; but its pectoral or forefins are very long, and capable of being expanded like broad wings. The abdominal, or ventral fins, are rather large and irregularly fan-shaped. In the water the fish swims, as most other fish do, with the tail, the long fins being folded against the body. But, not satisfied with swimming, it seeks to imitate the birds, and ever and anon it leaps into the air, and takes short flights, sustained on its broad pectoral fins. Ordinarily the fish are seen to rise from the water near the ship, and glide off diagonally, almost in the direction she is going, and very often right against the wind. They rise at a very low angle, and keep close to the water. On rising, the tail is seen to quiver, sometimes beating the water for several yards, leaving a wake behind, and at the same time there is a very perceptible tremulous motion of the fins; but when once fairly in flight, the fins, both pectoral and ventral, are fully extended. The latter are held obliquely downwards, while the position of the former seems to vary very considerably. Usually the forefins are inclined a little upward, while the body is carried with the tail a little lower than the head. If there is a heavy sea running, the fish is seen to rise and fall over every wave without touching the water, and this is done apparently with as

much ease as if it were a bird. I have observed that the vertical inclination of the "wings" is varied considerably, and the vertical undulations of its flight appear to be directed by these fins. It has evidently no power of directing its lateral motions, although one might rather look for the use of the tail for that purpose. If the fish darts right against the wind, its flight may be in a straight line, ending by its pitching plump into the water, but if the course be oblique to the wind, it is soon blown aside. Of the thousands of flying-fish I have observed, I have never seen one tack up into the wind, unless it plunged into a wave and took a fresh start, as is not infrequently the case, when it darts into the water and out again, like an arrow shot through a wave. I have spoken of the flapping of the fins on rising; during the rest of the flight this is ordinarily not observed, their only motion being the gentle variation in inclination; but if the animal finds itself settling before its flight is finished, as soon as the tail touches the water, that fin is agitated, while there is a fluttering seen of the pectorals: should the fish rise again, the fluttering ceases. The fish seen rising near the ship are evidently frightened by her approach. Looking over her bows when the waves are not disturbed by minor undulations, one may see shoals of them darting irregularly about in the water. Sometimes they spring up suddenly in clouds. The bonito, sharks, and other fish prey on the flying-fish, and the latter, when attacked, leap out of water to elude their enemies. One day we saw a school of *bonitos* which were ever and anon leaping out of the water. Before them the flying-fishes were flying away like clouds of grasshoppers in advance of one walking through a grass field. Overhead whirled some large, graceful, white, long-tailed tropic birds (*Phaëton*),

which were engaged in catching the flying-fish as they rose, so that the poor little animals found themselves safe nowhere.

The distance flown by one of these fishes varies greatly, and depends much on the wind. They frequently go two hundred to three hundred feet without moving the fins, but the little ones never fly far.* In these cases, the fish glides through the air with an initial velocity, obtained by the action of its tail-fin before leaving the water, and the flight is no more like the flight of a bird, than is that of the flying-squirrel, or the Galæopithecus. I have had a few opportunities of witnessing the flight of flying-fish during calm weather, when I have then repeatedly seen the common Exocœtus fly more than a hundred yards, and, in two or three instances, I have seen what appeared to be a different species fly at least a thousand feet in *a horizontal line*, with a perfectly well seen continuous movement of the fins like a bird. The first specimen I saw I took to be a little bird, and I should never have known it to be a fish had I not seen it disappear in the water, and soon afterwards seen others rise near the ship. These observations were made near Barbadoes, and at the time there was not a ripple to disturb the glassy surface of the ocean waves. This *flying* species seemed to me to be quite different from the common Exocœtus, having broader and darker-colored fins; but I did not see it sufficiently clearly to enable me to speak confidently of other than its general appearance, as my attention was occupied with its flight. Was it not a *Flying Gurnard*, or *Sea Robin?* (Dactylopterus).

When but a short distance north of the Amazonas, on

* Some of the little animals which leap out of the water in shoals, and are often mistaken for flying-fishes, are cuttle-fishes.

the present voyage, I was surprised at seeing not far from the ship that the blue color of the sea turned abruptly to a bottle-green. We were evidently on the edge of a current, whose boundaries were as well defined as if the blue ocean water through which it flowed had been solid land. This was probably the outer edge of the current flowing northward along this coast. We struck it immediately, and soon entered it, when to my delight I found the difference in color was owing to an immense number of little jelly-like animals which swarmed there so as to destroy the transparency of the water. Just on the edge of the current these were collected together in the most astonishing quantities, but in the blue water a foot from the edge I did not see a single one, so sharply defined was the line marked. This line ran about E.S.E., and extended to the horizon on both directions, while the opposite side, if there were any, was not visible. Half the circle of the sea was ultra-marine, half bottle-green. As soon as possible I had a bucket lowered, and after many trials some of the animals were captured; I found them to be *Salpæ*, a low kind of mollusk, with small, gelatinous bodies, almost perfectly transparent, and growing in compound communities, which swim by taking water into the cavity of the body, and propel themselves by the reaction caused by the expulsion of this water, in the same way as the cuttle-fish swims. There is a very interesting law which obtains among many of the lower animals, called the *alternation of generations*, according to which the offspring is unlike its parents, but like its grandparents. These *salps* are good examples of this law, for one generation consists of compound communities, and the next of single individuals. Some of the chains were three or four inches in length, and the individuals of which they were composed of the size of a gooseberry.

On the surface of this current floated hundreds of beautiful "Portuguese men-of-war" (*Physalia*), and we saw in eddies on the edge of the current two or three fleets of several hundreds each, looking like beds of large pink flowers, on a smooth green lawn. They drifted thickly by us, their brilliant floats careening on the wave. Now and then they were overwhelmed in the great foam sheet that broke from the steamer's bow; but their upset barks soon righted themselves, and floated away on the foaming waves astern. As I looked down on their airy, bubble-like forms, anchored deep in the green water by their numerous cables, how I wished I could capture one, but from the high deck of the steamer it was hopeless to attempt it.

Fancy now a light bubble-like float, of a semi-transparent membrane, blown plumply out with air, and shaped somewhat like an egg laid on its side, with the upper part flattened into a sort of a crenulated, or, to use a milliner's term, "pinked" crest. Tint this float of a rosy hue, deepening it toward the crest, and color the lower part a warm violet, and you will have a faint idea of the beautiful float of the "Portuguese man-of-war," one of the most interesting members of the class of jelly-fishes. But this is not all; this is really only the float or swimming sac of a colony of animals which hang from the lower part down into the water, like gelatinous cords. Agassiz tells us that in this colony the sack is one animal developed for the special purpose of sustaining the colony in the water, and that of the others some are constructed for one purpose and some for another; some catch the food, but it is, figuratively speaking, to please the palate of others, while what one eats goes to nourish the whole colony.

Sailors will tell you that the animal is poisonous, and burns the hand. Every one who has been on the sea-shore

has seen a common jelly-fish, and some may know that some species have the power of stinging. Talk about nettles and stinging ivy! The first specimen of the Physalia I ever collected, I found one evening at dusk on the shore of Porto Seguro. It was half-buried in the sand, much wilted, and I took it to be a shell, *Ianthina*. I picked it up, and while examining it, the long tentacles slipped through my fingers, and brought very forcibly to mind that they were very plentifully armed with minute cells, in each of which was coiled an exceedingly fine thread, which, thrown out on the bursting of the cell when it is touched, penetrates the hand, and immense numbers thus wounding the nerves produce a very intense burning sensation, which, sometimes extending itself up the arm, as it did in this instance, causes acute suffering. He who once takes a living Physalia in his hand will not be likely to pick up another.

On the 10th of July we arrived off the mouth of the Para river, the southern mouth of the Amazons; but as it was impossible to enter the river and pass the shoals in the night, we stood across the mouth for the light at Salinas, on the southern bank of the river. We were to sight the light at eleven o'clock, P. M. At half-past ten the engine was slowed, a man was in the fore-top on the lookout, and with a friend I remained on the bow peering anxiously into the darkness ahead, as the steamer plunged cautiously over the big swell. A dim light, like the first ray of a rising star, is seen. "Two points on the weather bow!" cries the man on lookout. A moment after and the light flashes brightly out and disappears. It is the realization of a *saudade*,* and the heart is glad!

All night we killed time steaming up and down, wait-

*A word as dear to the Portuguese as our word *home*, and nearly as untranslatable. It has all the meaning of homesickness, but it also expresses a deep longing to see an absent friend, or some loved distant spot.

ing for the morning. Day broke with the land in sight, no grand blue serras lying cloudlike on the horizon, but a long, low stretch of trees level as the line of the sea. Here we are in the mouth of the Para, but only one side can be seen, and from the middle neither side is visible, for it is here thirty-three miles in width.

There are a number of extensive sand-banks in the mouth of the river which make it difficult to enter. The main channel lies between two of these banks, over which the waves break sometimes fearfully. This channel is not more than two miles in width. An experienced pilot of the Para is attached to the steamer. We passed up the channel early in the morning against the tide, with a fine view of the breakers on each side. Hitherto there has been nothing to mark this channel, but lately two buoys have been placed at the entrance. What is much needed is a lightship, for at present the entrance is impracticable by night. Steaming up the river we soon left the brackish water, and came into the turbid waters of the Amazonas, finding ourselves on what seemed to be a fresh-water sea. The water is very muddy, and of a light milky brown. This is the color of the main river of the Amazonas. When one looks at the mighty flood pouring steadily out of the mouth of the Para, and strives to calculate the amount of solid material it is bearing down from the land to the sea, he cannot but be amazed at the work the giant river is doing towards cutting away the continent, and in spreading it out anew over the bottom of the Atlantic. About one hundred miles from the mouth of the Amazonas, a small stream flows off southward, when it meets with the Anapa, Pacajos, and the great Tocantins, which last is sixty miles wide at its mouth, and swells into the Para, which Agassiz calls one

of the mouths of the Amazonas, though apparently it receives only a small part of its waters from the main stream.

By and by the opposite bank of the river makes its appearance, and we have on each side a long level line of trees rising from the water. Looking both up and down stream, a water-horizon is seen; still farther up large wooded islands come in sight, and these like the shores are flat, and only slightly elevated above the water level. Looking up among the islands, it appears like looking out to sea from a large bay. The banks are very heavily wooded. There are no clearings of any size visible, and there are only a few little huts seen nestled in among the trees. On the projecting points along the southern bank of the river are stations from which are displayed signal flags, to give notice at Para of our arrival. At length, ahead on the water-horizon gleams a white object, which seems to be a ship; but the opera glass shows it to be the tower of a church, and the pilot tells us that it is the cathedral of Para, but it seems out at sea. Soon other towers rise above the turbid horizon, and ere long there gleam in the afternoon sun the white buildings of the city of Para, the capital of the province of Grat Para. It seems like the work of enchantment. With the city in view, we run along close to the southern shore, passing a few fazendas, some tile-making establishments, a church or two, all backed by the dense Amazonian forest, that sheet of vegetation, which, almost unbroken save by rivers, covers the whole Amazonian valley like a sea, to the very foot of the Andes. At a distance the forest resembles our own hard-wood forests, only it is denser and more luxuriant. Once in a while a large round-topped tree is seen, blushing deeply with blossoms like the top of a thunder-cloud bathed in the red evening sun-

light; but the only feature that strikes the uninitiated eye as tropical in this scenery is the occasional slender, graceful curved stem of a palm, with its beautiful leaf and crown. The breeze comes to us warm and fragrant, and one breathes it in in long draughts. But now comes a clearing, and a low projecting tiled roof is seen nestled in among the heavy foliage. In front is a long line of cocoa palms. One sees the large, deep green, shining leaves of the Jaca, or bread-fruit (*Artocarpus integrifolia*), two species of banana and orange trees, and would never dream he was anywhere else than in the tropics. There is one palm seen here (*Mauricea*) which I do not remember having seen elsewhere in Brazil. It is a large palm, with immense ragged-edged, fan-shaped leaves. There are numbers of them on the shore just below Para. Meanwhile that we have been sweeping the shore with an opera glass, watching the little Chinese-looking boats, with their leather-colored cotton sails, or a little Brazilian sidewheel steamer, outward bound, we come up with a little fort, an old-fashioned, circular structure, built on a tiny island a few miles down the river. Over the parapet appears the mouth of an enormous speaking-trumpet, that hides the head of the officer who hails the ship:—

"*D'onde vem?*" (Whence come you?)

"New York," answers the Captain.

"*Quantos dias?*" (How many days?)

"Nineteen."

"*Para onde vai?*" (Where are you going?)

"Rio de Janeiro."

"*Boa Viagem!*"

At five o'clock we are anchored off the city, having consumed the day in ascending the river, a distance of seventy miles, for all the morning we had to stem the strong outflowing tide.

# NOTES OF A FUR HUNTER.

BY HENRY CLAPP.

[When exploring the slate-bearing region of Maine last fall, I had occasion to employ as guide Mr. Henry Clapp, of Brownsville, Piscataquis county, of that State. His home is at the foot of the Ebeeme Mountains, which form the southern portion of a mountainous district, extending away north to, and including Mount Katahdin, a district well watered by the Penobscot and Upper Kennebec, and their streams, dotted with smaller lakes, and including also Moosehead Lake, Chesuncook, Joe May, and other large sheets of water. It is a country for a hunter to grow up and live in. In Mr. Clapp I found a man of life-long experience in this and other hunting-grounds, and at the same time an enthusiastic and careful observer, and one scrupulously exact in his statements. I had learned much from him about the mammalia of Maine, and one day when we were storm-staid, I took the following notes from his statements. I could easily rearrange them and enlarge upon them, but they seem to me to take their principal value from the fact, that they are a record essentially as given of an intelligent, experienced hunter's account of the results of his observations. — J. E. M.]

Panther, or Catamount (*Felis concolor* Linn.). I never saw a Panther, or Catamount. One night I found a deer bitten through the back. There were many tracks (not of deer) right about him, but I could not find any leading off from the spot. I think the beast jumped on to the deer from a tree. I heard his shrill screech, like that of a woman in distress. I heard the same screech and saw the same track again not far off. I think the animal was a catamount.

Lynx, or Loup-cervier (*Lynx Canadensis* Raf.). The Loup-cervier lives upon partridges, deer, rabbits, etc. It can climb trees. I have seen one in a tree. I have had one carry my trap with a heavy clog into a tree, and found him dead with it in the limbs. The animal is about

two feet or more high. They are quite numerous about here: one man caught nine within six miles of here. They are easily killed by a blow with a stick. I once found a fox's tail in a rabbit-path, with Loup-cervier's tracks about. I judged that the fox was going one way in the rabbit-path, and the Loup-cervier the other way, and the Loup-cervier sprang upon the fox and ate him, leaving his tail. They often go in families, five and six together. I met four one bitter cold day. They came on to the ice, not in single file, but right and left, and from four to six rods apart; and from examining their tracks, I judge this to be their habit. I think they travel in this way to scare up more game.

Wild-cat (*Lynx rufus* Raf.). The Wild-cat is not quite so large as the Loup-cervier. It has black rings around its legs; its fur is not so long as a Loup-cervier's; its foot is more like a dog's or house-cat's, the bottom of it being bare, while with a Loup-cervier it is covered with fur. Its leg is quite dark or black toward the foot. Its skin is not worth so much as that of a Loup-cervier.

Wolf (*Canis occidentalis* Rich.). I know little about Wolves. I have seen them, but never killed one. They often kill deer on the ice of the lakes; more on the ice, I think, than in the woods. I found one deer, which they had killed and skinned in such a way that I got a pretty good skin from it. They stripped it off so that it clung to the legs. It seemed to have been torn open along the belly. The meat was taken off, leaving only skeleton and skin.

Red Fox (*Vulpes fulvus*, var. *fulvus*). The Red Fox does not weigh as much as he appears to. His weight is about ten pounds. I have found but one that came up to eleven pounds, but have found a number that weighed

nine pounds. He lives on mice principally, also on beech-nuts, fowl, and rabbits. House-cat meat is good bait for them, so is honey, cheese, and pork scraps; and hog's liver is excellent. I make a bed as large as a cart-wheel, strew on ashes and chaff, and then get the foxes familiar with the place. I go there often myself, until they get so familiar with my track, finding it brings them no harm, that it does not scare them. A strange track, or mine, if I stay away a little while, would keep them off for a night or two. I cover my trap with ashes, which seems to prevent them from smelling it. I attach a grapple to my trap, so that when the fox runs off with it, it will catch and hold him before he goes far. I don't fasten it to the bed, because the digging of the fox caught would frighten away others. The fox is not so much afraid of the iron as of the man who handles it, and, therefore, I avoid touching the trap with my hand. If I have a dead horse, or other carcass, I throw it into a hollow where the snow will cover it. When the foxes have made a path to it, I set a trap in the path, covering it with snow from the carcass and the fox path, and making new tracks over it with a fox's foot if I have one. I don't touch anything about the trap with my hand, but use a wooden shovel. Sometimes I smear the trap with a mixture of tallow and fox dung.

Red Foxes are plenty about here. In 1865, I bought thirty-seven skins taken in the neighborhood. One SILVER-GRAY FOX (*Vulpes Virginianus* Rich.?), was caught in Brownville or Milo, three or four years ago, and was sold for $35.00. I have seen one skin of the BLACK FOX (*Vulpes fulvus*, var. *argentatus?*). It was from Sangerville. There is also a kind called CROSS-GRAY (*Vulpes fulvus*, var. *decussatus*), on account of a cross made by

dark color and gray. In 1865, Red Fox skins were worth $4.50 to $5.00. Last winter I paid $2.50 for them. I think they will be lower this year.

FISHER, or FISHER-CAT (*Mustela Pennantii* Erxl.). The Fisher is much like the sable, but larger, weighing six times as much, say from eight to ten pounds, some more than this. They live on rabbits, partridges, squirrels, and berries, especially berries of the mountain-ash; they are also very fond of porcupines, the skins often having quills stuck in them, which, however, do not enter far into them. They also eat beechnuts. The Fisher runs with a "lope" and a jump; I never saw one trot. He leaves but two tracks, one a little farther forward than the other, thus, ⁘, as do also the mink and sable. Sometimes they leave more, but the habit is to leave two. The color is dark-brown or gray. He nests in hollow pine stumps and ledges, I think. They are not very plenty about here. I caught seven last fall, and one this fall. The trap was set with bear's meat. I also caught a fox in the trap.

SABLE (*Mustela Americana* Turton). The Sable is of about the size of the mink, a little larger, and with longer legs. Its color is red or yellowish. It lives on mice, squirrels, partridges, rabbits, beechnuts, and mountain-ash berries. It don't like porcupine meat as well as the fisher. It will eat fresh fish, but I don't think it catches fish. I catch them in a "dead-fall" trap, sometimes in a steel-trap. I catch them in the mountains north of here. They nest in hollow trees. I never saw a sable swim; I once thought I saw one swimming, but when I caught the animal, I found it to be a mink, with the sable's color. They are never very plenty about here. Price of skins last winter, $2.25 to $2.50; year before last, $3.50 to $3.75.

WEASEL (*Putorius*).* The Weasel lives principally upon mice; is said, I don't know how truly, to kill hens and partridges. Once I found that some duck feathers I had left in a camp had been dragged into a barrel of hard-bread by a weasel, for lining to a nest. I have had them so tame in the camp, as to come into my lap and eat fresh fish and partridge. They are brown in summer, and white in winter.

MINK (*Putorius vison* Rich.). The Mink is a sly, thievish creature. They eat fish and frogs. I have seen where they brought the frogs in to their young. The nest was under the roots of a tree. The color is black or dark brown; when shedding their coat, they are a little more reddish. We catch them in both "dead-falls" and steel-traps, baited with fresh fish; though they will take also muskrat, partridge, and red squirrels. They are not very plenty about here. Their skins are worth $5.00 to $6.00.

OTTER (*Lutra Canadensis* Sab.). I estimate the weight of a good-sized Otter at thirty pounds; their average weight is twenty-five to thirty pounds. They live on fish and muskrat. They dive down, and then rise into the passage way of the muskrat house, so as to push their jaws into the house and catch the muskrat, unless, as is sometimes the case, the muskrat has a second passage to escape through. The otter has no house, but lives in holes in the banks of streams, and in hollow logs, and under roots. His hind-foot is partially webbed; I don't remember about his fore-foot. He dives and chases fish under water. I saw one do this, and then shot him. He seems to like to slide instead of walking down a slope. He seems to have certain places for voiding his excre-

*Several species of this genus go under the general name of "Weasel."—EDS.

ment. Color, dark-brown or black. Legs very short; body and tail very long. He is a roving animal. The skin sells for from $6.00 to $8.00.

SKUNK (*Mephitis mephitica* Baird). The Skunk lives on locusts and crickets principally; will eat chickens and suck eggs. They are plenty about here. The skin is worth ten to fifteen cents, and has been worth fifty cents. I bait them with meat.

RACCOON (*Procyon lotor* Storr). The Raccoon is very rare about here. I have caught them in a "dead-fall," baited with fish. I have known them to go into the corn-fields and eat corn. The skin is worth from half a dollar to a dollar.

BLACK BEAR (*Ursus Americanus* Pallas). I don't think there are two species of bears in the country here, but the single species varies exceedingly in color and size and disposition. I had at one time two tamed, which I caught with their mother when they were cubs. One was what is called the "Ranger" Bear, that is, it was long-legged and long-bodied, and not so black, and with a little coarser fur than the other variety. The other was what is called a "Hog Bear," and was shorter-legged and blacker. So I am sure the Hog Bear and Ranger are of one species. I have seldom found two alike. I have caught a great many, as many as sixteen in one year, from May 1st to July 1st, around Schoodic and Seboois streams, a few miles east of here. I caught seven the last summer. The larger of the two tamed ones I had was of a milder disposition, and would learn more tricks than the other. Both were females. They had a disposition to pry into everything. One of them got into the pantry once, and upset the flour barrel and went to eating the flour. When she got her mouth so full as to be

clogged, she would clear it out with her paws. She threw the sieve and breadboard out into the kitchen very handily. Another time she got in and took the eggs. They like milk, and honey, and molasses. One of mine would drink milk from a dipper, holding it in her fore-paws. One of my tame ones, if she got loose, would find every hen's nest in the barn and eat the eggs. In the woods they feed on berries and beechnuts and acorns and roots; and they will eat meat of any kind, and will take bear's meat for bait; they will eat fresh fish, corn, and pumpkins, and are fond of oats; in the spring they are fond of the offal left where moose are dressed.

They strike their enemy and try to throw him down, and then bite and tear him. I never saw them hug, and don't believe they do it. They can climb small trees as well as large ones; I have seen where one climbed a cherry tree not more than three inches in diameter. I kept one of my tame ones till she was six years old, and have time and again seen her climb a pole four inches through. She climbed with the ends of all her claws touching the pole; would climb deliberately, and a hundred times a day for gingerbread, apples, etc. She would walk hand over hand along a horizontal pole with her body hanging under it. They climb the tallest of beeches, and break off limbs two inches through, and throw them down, and then come down and eat the nuts. If the limb wont break, they bite it with their teeth, and then pull it toward them and break it. They also gather a part of the top of the tree together, and eat the nuts there.

Bears hibernate, going from three to four months without eating; sometimes during December, January, February, and March, sometimes during January, February,

March, and April. This year there are no beechnuts, and they will probably disappear early. As soon as they begin to eat in the spring, a plug comes away from them, black, shining, and hard, resembling gum, so much so, that some say they eat gum to form it; but it is not so, for the same came from the tame ones in my barn, where they could get no gum. I think it is from the mucous in the intestines. In the barn they covered themselves with straw all over, excepting their ears. Their paws were brought forward around the nose, which was dropped forward and downward. They don't suck their paws. When I spoke to the tame ones in my barn during the winter, they would look up very bright, but would run out their tongue, gape, and drop their heads forward and down between their paws again. I could see the motion of their breathing, and in a cold day could see their breath condensing. I noticed this particularly, because I have heard it said that they did not breathe when hibernating. In the woods they make for winter-quarters a nest of leaves and cedar bark, and I have sometimes seen cedar and fir boughs in their nest. I don't think they get enough of the material to cover themselves as completely as the tame ones did in my barn.

Bears bite fir and spruce trees, and tear down the bark, and when one has bitten a tree, others are apt to do the same, and thus their ranges or lines of travel become spotted as it were. They follow their ranges year after year. The skin of a bear is worth from $3.00 to $12.00.

Gray Squirrel (*Sciurus Carolinensis* Gmelin). Have seen a few Gray Squirrels this year; never saw but one before.

Red Squirrel (*Sciurus Hudsonius* Pallas). The Red Squirrel deposits his winter store in several places. The

bear often finds the half-pint of beechnuts hidden by the Red Squirrel under the leaves and eats them.

STRIPED SQUIRREL (*Tamias striatus* Baird). The striped Squirrel deposits his winter store in a single place.

WOODCHUCK (*Arctomys monax* Gmelin). The Woodchuck lives in holes in the ground; is partial to beans, but lives principally on grass. I think it hibernates.

BEAVER (*Castor Canadensis* Kuhl.). I have caught seventy Beavers. Have killed seven from one house, and left one or more. I killed five from another house, and opened the house, which was about four feet across on the inside, and two feet high. It was oven-shaped. There was but one room to it, and I never saw a house with more. The houses are sometimes round, sometimes oblong. The house is made of brush thrown into a pile, and covered with mud and sticks. The room is eaten out of the brush; that is, the brush is in a pile, and the room is made by gnawing out a part of it. The passage way is a ditch passing downward and forward into the water, and is covered with brush and mud. Right on top of the house is a part of the roof where there is no mud on the sticks, thus leaving the wall open enough there for ventilation.

The Beaver makes his pond to enable him to bring and store his food, which is the bark of white birch, yellow birch, mountain ash, swamp maple, poplar, and willow, and perhaps some others. They throw their brush over their passage way, so that the top of it is in the water; that is, the butt of the bush is over the passage way, and the twigs of the top in the water. They cut down the trees, which are for food, and stick the butts under the brush, leaving the tops to float. If the tree is

larger than one and a half inches, or two inches at farthest, the beaver cuts off the top, and drags it and the stems to his house separately. I have seen the wood as large as five inches, and three or four feet long. Have seen a white birch felled by them four inches in diameter. In the winter they come up under the ice and gnaw their bark there. Gradually in such places air collects under the ice, which is, I think, what they breathe out when they are there. I have seen one stay under water seven and one-half minutes by the watch, and have heard from a reliable man of their staying twelve to fourteen minutes. The Otter will kill young Beavers. I don't know of anything else that destroys them except man. Their meat is excellent, and the meat from their tail is a delicacy.

*The Dam.*—I will describe one dam. It was lately built. It was six rods long; not straight across the stream, but the middle was further down stream than each end. The groundwork was of small alders, cherry trees, and bushes. Nearer the top, trees from one to one and a half inches in diameter were placed on, the butt being hauled over so as to rest on the bottom of the stream below, and the top woven into the dam. On the up-stream side it was covered with moss, mud, gravel, and rocks, and some of the rocks I judge would weigh fifteen to twenty pounds. The water dripped over the dam evenly the whole length. The dam flowed the pond above, which was a mile long. It was not at a narrow place in the brook. It had been built the summer before, and in the fall while I was there, I caught six beavers there, and think I caught them all. There were seven houses in the neighborhood, but only one of them was new. I drove them from this to one of the old ones, and

then to another. This last was a mile from their dam. They began to haul wood to it. I caught none at the new house, but two at the first old house they fled to, and four at the second. I frightened them from the new house by paddling around it in my canoe. It was on an island. They work on their house, putting mud and sticks on it, till freezing weather.

I will describe another dam and settlement of Beavers, on the Restigouche River, in the northern part of New Brunswick. The pond flowed was a mile long. At the foot of the pond was a dam five feet high. Four rods below was a dam three feet high which flowed back to the first dam, raising the water against it one and one-half feet. Three rods farther down the brook was a third dam, not more than two feet high, also flowing back to the dam next above. A rod or two below was a fourth dam, not more than one and a half feet high, which flowed the water back to the third dam. There were two beaver-houses on the pond. The new one, which was the one inhabited, was one-quarter of a mile above the dam. The old one was fifty to sixty rods farther up. I killed seven beavers here that winter (1852 or 1853). I cut the second .and third dams down a little at the middle so as to have a running, open stream, and caught four otters there during the winter.

I never saw more than one passage way to a beaver-house, but it was said that there were several to this house. It was, by outside measurement, twenty-one feet across at the base; and we judged it to be ten feet high, but it had the appearance of being two houses joined together. The men who opened it said it had but one room, and nine beavers were in it. I don't think the beaver uses the tail much in swimming, but it makes

much use of it in diving. In trapping, we take care not to drive the beavers away from the pond before it freezes; after it freezes they leave very reluctantly. We bait with swamp maple or mountain ash. We tie the trap to a dry spruce stake, which they will not gnaw.

The beaver weighs from twenty-five to sixty pounds; the latter weight is very large. A good beaver-skin weighs from one to three pounds; price now $2.50 a pound.

I think the beaver gets the oil from the "oilstone" on to his fur by letting it out into the water around, whence it is caught on the fur. I use the "castors" to attract the beavers.

Muskrat (*Fiber zibethicus* Cuv.). The muskrat lives in hollows in banks of streams, and also in houses. Eats roots, grass, and clams.

Porcupine (*Erethizon dorsatus* F. Cuv.). The porcupine lives in winter on bark. It eats grass; will eat green corn when it can get it; it is very fond of salt; will even gnaw through pork barrels to get the salt. It has been known to get into the cellar and take milk. It is destructive to boots and rigging and tools, where any salt has been left on them.

Moose (*Alce Americanus* Jardine). Moose move over but a small district in a winter's day, four or five miles; sometimes in a thaw they move farther. When their tracks are obliterated by the snow, I often track them in this way: I notice the side of the tree from which they have taken the bark. This was the first side of the tree they came to; they then moved on and took the bark from the first side they come to of another tree, and thus left a "blaze" behind them. Sometimes when the old cow lies down, the calf will eat the bark all around the

tree, but this is not the rule. They seem to tear the bark up with the teeth of the lower jaw. Sometimes they may be found in the spring not more than a mile away from where they began in the fall.

They like best the bark of moose wood (the small maple with dark striped bark), mountain ash, and swamp maple. They take the bark of the mountain ash more than of any other tree; but they browse the twigs of the swamp maple most. They will also browse fir and willow and moose bush, and sometimes cut the bark of poplar. They also frequent ponds for the pond lily and the yellow lily.

The largest herd I ever saw had nine in it, but they more often live in herds of four or five. The female brings forth two calves, and they stay with the old cow the summer and winter following. The males more often yard by themselves, but are sometimes found with the female. The sexes come together about the last of September or the first of October, say from September 20th to October 20th.

Moose are not now very plenty about here, but ten years ago they were plenty. I killed two in one August night in Lower Ebeeme pond. They come into the ponds to feed on the lilies. I have seen them in the pond the first of June, with the water half way up their sides, reaching down and taking up the roots of the yellow lily. They come out on very soft bog with no trouble; they drop their body so as partly to swim and partly to wade till they come to shore, then they put their nose on the shore, if it is soft, then raise their forelegs, and then their hind legs one at a time. When swimming undisturbed, I have seen a moose settle down under the water entirely for three or four rods, and then rise and snort

and go down again. Whether he did this to get the flies from his ears, or whether it is his habit, I don't know. A young man who hunted moose with me had seen the same thing, and spoke to me of it. When undisturbed they move, on land, slowly and quietly, but when startled, are all alive. Their principal gait when not walking is a trot, while the deer jumps. In the season for the coming together of the sexes, I have seen the male standing on a log, and heard him grunt at intervals; at other times I have heard them low aloud. Sometimes we call them by imitating the low of the male by sounding through a roll of birch bark. The *males* answer this cry, and come to it; and as they draw near we place the mouth of the trumpet near the water, or, if on land, near the ground, which makes the sound seem farther off, and leads the moose to rush on. When he gets pretty near, it don't do to keep up the deception; then we dip up and pour out water, which brings him right out; or, instead, make a kind of "splash" with the paddle, or any noise that will sound like the stepping of a moose in water. Care should be taken to keep to the leeward of the moose if possible.

A common way of hunting them is to watch in summer nights at places where they come down for lily-pads, and shoot them there. Another way is to hunt them down in winter when there is a crust.

The average weight of a moose's meat after it is dressed is four hundred to five hundred pounds. I have killed one which I think weighed, meat and hides, one thousand pounds. I weighed the meat of one which weighed six hundred and thirty pounds. Moose meat is worth say ten cents a pound, and the skin has been worth from five to twelve dollars since the beginning of the war; I don't know what it is worth now.

CARIBOU (*Rangifer Caribou* Aud. and Bach.). Caribou are quite plenty a little north of here, about Ragged Lake, Black Brook, etc. Caribou live principally on moss, but eat some twigs. It is faster, I think, than either deer or moose; of these two, the deer is the faster. The meat of a caribou when dressed weighs, I judge, from two hundred and fifty to three hundred pounds.

DEER (*Cervus Virginianus* Boddaert.) Deer are not very plenty about here. They browse "moose-bush," fir, cedar (Arbor vitæ), willow, swamp maple, and lynois bush; in summer they like lily-pads, leaves of trees, and grass. I think that, like the moose, the deer generally bears two young.

[We have introduced the scientific names of the animals mentioned by Mr. Clapp, and would refer those of our readers who wish for information regarding their classification and distribution to the comprehensive and invaluable work of Professor BAIRD, on the "Mammals of North America," forming the *eighth volume* of the Pacific Railroad Reports, published by order of Congress in 1857. —EDITORS.]

## THE LAND SNAILS OF NEW ENGLAND.

BY EDWARD S. MORSE.

(Concluded from page 609.)

THE following species, though minute, are very characteristic, and with the aid of the engravings, but little trouble will be encountered in identifying them. Formerly included under the old genus Pupa, they are now separated under a distinct genus called Leucochila. But slight differences are noticed between the soft parts of the species to be described, and those given previously.

LEUCOCHILA CONTRACTA *Say* (Fig. 54) is an oval,

conical, whitish shell, having five convex whorls; the spire tapering to a somewhat pointed apex. The aperture is quite large, and is bordered by a widely reflected lip. The aperture is nearly closed with four tooth-like folds, and one is inclined to wonder how it is possible for the animal to protrude and withdraw his body within the shell. The shell has a distinct umbilicus. Length one-tenth of an inch. Animal blackish above; disk light gray. Almost universally distributed throughout the United States east of the Rocky Mountains. It is not a common species in New England. Found in beech groves under bits of rotten bark.

Fig. 54.

LEUCOCHILA ARMIFERA *Say*. (Fig. 55.) This is a much larger species than the preceding one. The shell is cylindrical oblong, of a waxen-white color, having from six to seven smooth convex whorls. Apex rather obtuse; lip reflected, nearly surrounding the aperture. Within the aperture are four or five projecting teeth, the largest being bifid, and starting from the body whorl; in others projecting from the walls of the aperture, and deep seated. Shell slightly umbilicated. Length $\frac{3}{16}$ inch; diameter half the length; animal black. This species appears to be plentiful in many of the Middle and Western States, extending as far east as Vermont, where it has been found on the shores of Lake Champlain.

Fig. 55.

Fig. 56.

LEUCOCHILA PENTODON *Say*. (Fig. 56.) This species is a third smaller than *L. contracta*, being only $\frac{1}{15}$ of an inch in length. It has about five whorls; is whitish or greenish-white; translucent, though often obscured by dirt that adheres to its surface. Aperture having a thickened ridge within, on which are

several minute teeth, the longest one projecting from the body whorl. The number and size of these teeth vary greatly in this species, but the shell is quite characteristic when once determined. It is found in very wet places, under bits of wood by watery ditches. Found in nearly all the States this side of the Rocky Mountains; common in New England.

In the following species the lower tentacles are absent, and the head has lappets on each side, and when viewed beneath seems partially separated from the creeping disk, more like the fresh-water air-breathing snails. As they are best known as Vertigo, we describe them under that head. As the species are very minute, we have given not only magnified figures of the entire shell, but a still more magnified figure of the aperture, as the characters of the species lie mostly in the contour of this portion of the shell.

VERTIGO OVATA *Say* (Figs. 57, 58) has an ovate, dark, amber-colored, and highly polished shell. Within the aperture are seven or eight teeth; these vary greatly in different specimens.

Fig. 57.

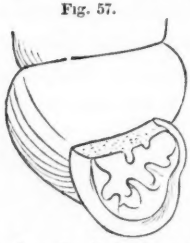
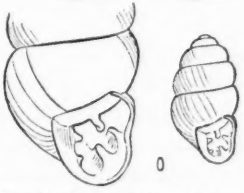


Fig. 58.

This is the largest of New England Vertigos, though measuring only $\frac{3}{40}$ of an inch in length, and $\frac{1}{25}$ of an inch in breadth. It is more globose than the species to follow, and has more teeth within the aperture. This species is almost aquatic in its habits, living under bits of wood and stones, in wet and soggy places. Inhabits all the Western, Middle, and Eastern States. Is common in New England.

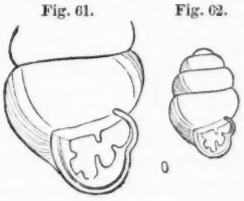
VERTIGO GOULDII *Binney*. (Figs. 59, 60.) This species is smaller than *V. ovata;* is not so broad compared to its length, and is not polished, but distinctly striated. The teeth within the aperture are five in number, that on the body whorl very large. Length of shell $\frac{1}{16}$ inch, breadth $\frac{1}{32}$ inch. It occurs in woods and groves under leaves. It appears to be common in New England, and has been found in some of the Middle and Western States.

Fig. 59. Fig. 60.



VERTIGO VENTRICOSA *Morse*. (Figs. 61, 62.) In outline the shell resembles that of *V. ovata*, and it has always been confounded with that species. The shell is much smaller, however; has one whorl less, and has only five teeth within the aperture. Length $\frac{7}{100}$ inch. It is not a common species, though I have received it from New York, New Hampshire, Massachusetts, and Maine.

Fig. 61. Fig. 62.



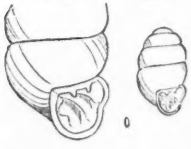
VERTIGO BOLLESIANA *Morse*. (Figs. 63, 64.) This species has been heretofore confounded with *V. Gouldii*. It has a small shell, lighter colored, polished and translucent. The teeth are five in number, but less prominent. Length $\frac{8}{100}$ inch. Found in hard-wood growths, in company with the smaller snails. It is not a common species.

Fig. 63. Fig. 64.

VERTIGO MILIUM *Gould*. (Figs. 65, 66.) Despite the infinitessimal character of the species described above, this species is much smaller than any of the others, being only $\frac{4}{100}$ inch in length, and weighing but $\frac{5}{1000}$ of a

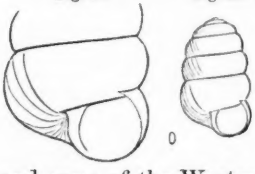
grain! and this tiny shell encloses a pulsating heart, a lung, stomach, liver, and all the organs we find in the larger snails. The shell has six teeth within the aperture, those on the lower portion of the aperture being long ridges running far within the shell. This species is found under decaying leaves in woods, and sometimes under stones in open pastures. It has a wide distribution in the United States, though it is rarely met with on account of its exceeding minuteness.

Fig. 65. Fig. 66.



VERTIGO SIMPLEX *Gould*. (Figs. 67, 68.) The shell is quite long and cylindrical, having five whorls. The aperture is entirely devoid of teeth, and has a sharp lip. Length $\frac{1}{15}$ of an inch. Found in all the New England States, New York, and some of the Western States.

Fig. 67. Fig. 68.



VERTIGO DECORA *Gould*. Mr. L. L. Thaxter has found this species at Ascutney, Vermont. We learned this fact too late to prepare a figure of it. We may briefly state that it is something like *V. Gouldii*, though twice the size of that species, and darker colored. It was first discovered in the region of Lake Superior, and one specimen has been identified from Great Slave Lake.

The following group, though air-breathing, are amphibious in their habits. The animal has only two tentacles, with no power to draw them within the head, as in those above described. The eyes, instead of being at the tips of these tentacles, are at the base.

CARYCHIUM EXIGUUM *Say* (Fig. 69) has an elongated

white shell, with five convex whorls, tapering gradually to the apex. Aperture obliquely oval, bordered by a roundish, thickened margin. On the outer margin of the aperture, there is a tooth-like projection, and on the inner margin there is another more prominent. Length of shell $\frac{1}{15}$ inch. Lives in very wet and boggy places in woods. Found in nearly all the States east of the Rocky Mountains.

Fig. 69.

ALEXIA MYOSOTIS *Drapanaud.* (Fig. 70.) Shell ovate, conical, smooth, horn-color. Spire having six or seven whorls, making a short, elevated, pointed spire. Aperture long and narrow, having on the inner margin two or more thin white teeth. Length $\frac{3}{10}$ inch. Found in the crevices of old wharfs and sea-walls, below high-water mark. It is never found away from the salt water, and if it breathes air like the rest of the group, it must take in a supply at low tide.

Fig. 70.

MELAMPUS BIDENTATUS *Say.* (Fig. 71.) Shell ovate, conic, whorls five, the last one three-fourths the length of the shell. Apex short; aperture having two folds or teeth on its inner margin. Color brownish horn. In adult specimens the shell is whitened from erosion. Very young specimens are oftentimes ornamented by dark, revolving bands. Length not quite half an inch. Inhabits the salt-marshes of our coast, where they may be found by thousands just below high-water mark. It is found all along the coast to Florida, though extremely rare north of Massachusetts Bay.

Fig. 71.

With this species we close the description of the Land Snails of New England as continued articles. In a future number of the NATURALIST we hope to give an account of the Slugs or Snails without external shells.

To those who have not the earlier numbers of the NAT-

URALIST, we would say that the terms used in describing the different species are explained and illustrated in the April number, and that a general account of their habits and anatomy may be found in the March number.

## REVIEWS.

THE QUARTERLY JOURNAL OF PSYCHOLOGICAL MEDICINE AND MEDICAL JURISPRUDENCE. Edited by *William A. Hammond, M. D.* Vol. I. Nos. 1, 2. July, October, 1867. Quarterly, 8vo. A. Sampson & Co., New York.

Our notice of this journal, which fills an important gap in medical literature, has been long delayed. It will also interest many of our readers, as it bears on those subjects in which all naturalists, especially physiologists, are most interested. The three leading articles are contributed by the Editor. The article On Instinct, its Nature and Seat, gives an excellent summary of the views of various writers on a subject on which much has been written without reaching satisfactory results.

The author's views may be summarized thus: Animals perform three sets of actions; 1st, *reflex*, such as eating, breathing, respiration. "The new-born child does not breathe because of a 'natural blind impulse' to do so, but because the placental connection with its mother, by which its blood was oxygenated, having been severed, and the stimulus of atmospheric air having been applied to its skin, an impression is conveyed to the nervous centres, it is reflected to the respiratory muscles, and breathing takes place." This is a reflex action of the nervous system. It is not instinctive or an act of the reason. 2d, *instinctive*, which are "the result of impressions received from within." "Instinct is that innate faculty which organic beings possess, by which they are enabled or impelled to perform acts without being prompted by the intellectual powers, and even in direct opposition thereto." Dr. Hammond, from whom we have quoted, further states that "instinctive acts are not the result of instruction or experience. This is one of the most prominent points wherein the actions in question differ from those which are the result of intelligence and reason." 3d, *rational*. These are, as the author states, of

"eccentric origin, due to impressions conveyed to the mind through the senses and nerves."

Instinct is strongest in the lower animals, and the new-born of the higher. The young acts first by instinct, until experience and contact with the outer world awakens the dormant reason.

The author thinks that instinct is capable of improvement, that it can be educated through a series of generations, so that "the intelligence of former generations becomes converted into instinct in the descendants." Instances of the aberration of instinct are also common; it is not unerring. All organized beings have instinct. "Plants have instinct; that is, a force co-existent with their growth, and implanted originally in the seed, which impels them to the performance of actions, calculated to preserve their existence, or secure their well being."

We refer the reader to the article itself for facts in illustration of these statements.

## NATURAL HISTORY MISCELLANY.

### BOTANY.

Botanical Notes and Queries. — Is *Tillandsia usneoides*, the "Black" or "Long Moss" of the Southern States, strictly an epiphyte, or in some sort a parasite? I was once informed by a very intelligent person, that in Florida, where the *Tillandsia* is used by lumbermen as fodder for cattle, the plant always withered and died when the tree that bore it was cut down, showing that it is not merely epiphytic upon the dead surface of the bark. The point is worth investigating. My attention is recalled to this point by a paper on *The Relation of Lichen-growth to the health and value of Trees*, read by Dr. Lindsay before the last meeting of the British Association. Noting that arboriculturists generally regard Lichens as detrimental to the trees they grow on, Dr. Lindsay adduces, in confirmation of that view, the fact that Lichens of the sort, such as *Usnea*, *Ramalina*, etc., contain silica, alumina, lime, potash, phosphates, etc., which could not have been derived from the atmosphere, but must have come from the foster-tree. It does not certainly follow, however, that the Lichen is parasitic, as Dr. Lindsay is disposed to think, for the thallus may as well take up these earthy elements from the dead and decaying bark, and be without connection or contact with any living part of the tree. The general opinion of nurserymen and tree-growers is, that Lichens feed upon the tree, or at least in some way injure it. — A. Gray.

SALSOLA KALI GROWING INLAND. — Every summer, for the last five years, on botanical excursions, I have found at Newburgh (sixteen miles from this place) the *Salsola Kali*, growing quite abundantly on the Erie railroad near that city. All the works on Botany that I have, designate this as a *maritime* plant, and give no other habitat for it. Those specimens which grow most vigorously are found covering the side of an embankment (formed of dry, loose sand) facing the south, and consequently exposed to the scorching rays of the sun all summer. The material in which the plants are rooted is not one from which I should suppose that they could derive any of those saline matters that enter so largely into their composition. — W. R. GERARD.

ROBINIA HISPIDA. — The responses to the query in the November number about this plant are unanimous, and direct to the point, that it is simply and truly indigenous in the pine barrens of the low country, and on barren or rocky hill-tops of the upper country of the Atlantic Southern States. Dr. M. A. Curtis has fruiting specimens collected on the summit of Table Rock, North Carolina (a conclusive station as to nativity), and thinks that it fruits in the lower country as well. — A. GRAY.

## PROCEEDINGS OF SCIENTIFIC SOCIETIES.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. — NATURAL HISTORY SECTION. *Burlington, Vt., August* 21-26, 1867. — "The Insect Fauna of the Summit of Mount Washington, as compared with that of Labrador." By A. S. Packard, jr., M. D. The following notes are thrown together rather to give a summary, from data only approximately correct, of our present knowledge of the distribution of Alpine and Arctic Lepidoptera, than to give anything like a complete account.

The summit of Mount Washington, or that portion lying above the limit of trees, agrees in its climate and other physical features very closely with those of the coast of Northern Labrador, as observed at Hopedale, in latitude 55° 35′.

The seasons correspond very exactly, as the snow melts in the early summer, and ice is formed early in the autumn at about the same dates.

As is well known, the Alpine flora of the White Mountains is identical with that of the arctic regions, which extends far southward along the Atlantic shore of Labrador. Not only is the flora identical so that no species of plant is known to be restricted exclusively to our Alpine summits, but the times of leafing, of flowering, and fruit-

ing of plants is much the same. Such was observed in the *Rubus chamæmorus* and *Arenaria Greenlandica*, for example.

It is also the same apparently with the fauna. The *Chionobas semidea* flies late in July and early in August, in greatest abundance, at the same time that its representative species swarm over the bare rocky hill-tops of the Labrador coast. Their appearance heralds the close of summer, both on the extreme summit of Mount Washington and the exposed hills of Labrador.

Most is known of the Lepidopterous fauna of Alpine and arctic regions, both in America and Europe, and our data will be drawn from this group of insects. In Europe, Thunberg, Zetterstedt, Duponchel, Boisduval, Staudinger, and Wocke, have studied the circumpolar lepidopterous fauna; Möschler and Christoph, Clemens and Scudder and the writer, have described the insects of Labrador, and Messrs. Scudder, Shurtleff, and Sanborn have explored the insect fauna of Mount Washington, and other Alpine summits.

According to Dr. Staudinger, out of sixteen butterflies found in Finmark, two only (*Erebia Manto* and *Argynnis Thore*) occur in the Alps, and also in Siberia. But one butterfly, *Chionobas Aello*, so far as we have been able to learn, is peculiar to the Alps. Of 122 species of lepidoptera inhabiting Labrador, 81 are found only in Labrador, and arctic America, while thirty-one are circumpolar, namely, occur on both sides of the Arctic Ocean, being found in Finmark, Iceland, and the mountains of Norway; six species inhabit the summit of Mount Washington, and four or five of the whole number also inhabit the Swiss Alps. Two of the European Alpine species are found on Mount Washington, New Hampshire.

Certain genera among Insects, as among Mollusca, are almost exclusively arctic. Such are *Chionobas* and *Anarta*, which are paralleled by the two marine genera *Astarte* and *Buccinum*.

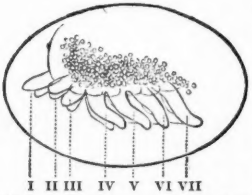
Two species (*Polyommatus Franklinii* and *Cidaria polata*) abounding in Labrador and the polar regions have not yet been found on Mount Washington. This is paralleled by the occurrence of certain mollusca, e. g. *Leda truncata*, in the high arctic seas, which have become extinct in the seas southward, where they are now found fossil; so that the distribution of the arctic insect fauna seems to be paralleled by that of arctic marine invertebrates. As in the temperate seas certain abysses and banks swept by the arctic currents are peopled by outliers of an Arctic marine fauna, so the Alpine elevations or atmospherical abysses, rising out of a temperate into an Arctic climate, seem peopled by outliers of an arctic land fauna. These outliers are relics of an arctic fauna, that during the early part of the Quaternary period, *i. e.* the Glacial Epoch, peopled the surface of the temperate zone.

We cannot suppose a special creation of organized beings for the Alpine summits. *Chionobas semidea*, thus far only known to inhabit the summit of Mount Washington, may still be found northward; or, if not, probably became extinct north, finally localizing itself on the single peak where it now occurs.

"On the Development of a Dragon-fly, *Diplax*." By A. S. Packard, jr., M. D. 1. In all the eggs observed, the blastoderm had been formed, and consequently the blastodermic cells had disappeared, and, at this stage, there was a clear space about what is probably the anterior pole of the egg, where the head is eventually to be developed.

2. In the next stage (Fig. 1) the head is partially sketched out, with the rudiments of the limbs and mouth-parts; and the sternites or ventral walls of the thorax and of the two basal rings of the head appear. The anterior part of the head, the so-called "procephalic lobe" overhangs and conceals the base of the antennæ.

Fig. 1.

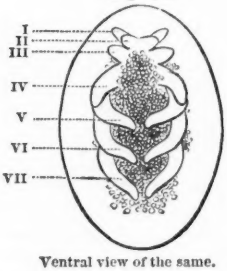



Side-view of embryo. The procephalic lobe is not shown. I, antennæ; II, mandibles; III, maxillæ; IV, second maxillæ [labium]; V-VII, legs. These numbers and letters are the same in all the figures. The underside [sternum] of six segments are indicated.

The antennæ, mandibles, and maxillæ form a group by themselves, while the second maxillæ (or labium) are very much larger and turned backwards, being temporarily grouped with the legs.

There are traces only of the two basal sterna of the abdomen. This indicates that the abdominal segments grow in succession from the base of the abdomen, those at the extremity appearing last.

Fig. 1, *a*.




Ventral view of the same.

The development of the hinder or post-oral rings of the head, together with the antennal segment, *i. e.* the first one in front of the mouth, at this time accords with that of those of the thorax, so that the process of development of the two regions and their appendages are identical throughout.

3. In the next stage (not figured) the yolk is completely walled in, though no traces of segments appear on the dorsal and pleural areas. The yolk granules fill the entire cavity of the body extending into the appendages. The head has enlarged, the remaining abdominal urites appear, and the abdominal lobe or post-abdomen

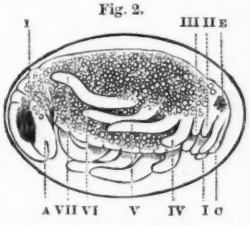
is indicated, being curved under the body, and touching the middle of the abdomen.

The rudiments of the eyes appear as a darker rounded mass of cells indistinctly seen through the yolk-granules, and situated at the base of the antennæ. The three anterior appendages, when seen sideways, are equal in size and length, the antenna being very contiguous to each other.

The second maxillæ are a little over twice the length of the first maxillæ and are grouped with the legs, being curved backwards. They are, however, now one-third shorter than the anterior legs. The second maxillary sternum is still visible.

The legs are now unequal in size, the two anterior pair being of the same length, though the middle pair are slightly thicker than the first pair; while the third, or posterior pair, are a third longer, and drawn back upon the side of the body, the ends nearly reaching the end of the egg.

Fig. 2.



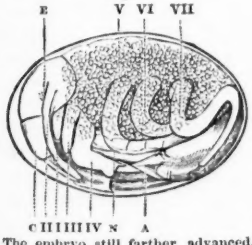

An embryo much farther advanced. C, clypeus, forming a part of the "procephalic lobe;" E, eye; A, bi-lobed extremity of the abdomen; I, the rudiments of the intestine.

The tip of the abdomen (or post-abdomen) consists of four segments, the terminal one being much the larger, and obscurely divided into two obtuse lobes.

The abdominal sterna (urites) are now well marked, and the nervous cord is represented by eight or nine large oblong-square (seen side-ways) ganglia, which lie contiguous to each other.

The formation of the eyes, the post-abdomen, the sterna, and median portion of the nervous cord seem nearly synchronous with the closing up of the dorsal walls of the body over the yolk-mass.

Fig. 3.




The embryo still farther advanced. N, nerve knots or ganglia

4. The succeeding stage (Fig. 2, compare Zaddach's fig. 40) is signalized by the appearance of the rudiments of the intestine, while the second maxillæ are directed more forward.

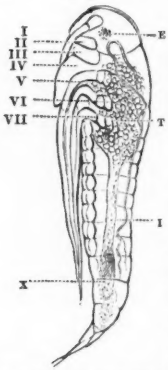
5. This stage (Fig. 3), is characterized by the differentiation of the head into the ophthalmic ring, or eye-bearing piece, and the supraclypeal piece, and clypeus, together with the approximation of the second pair of maxillæ, which, when united, form the labium, the extremities of which are now situated in the middle of the body.

The antennæ now extend to the middle of the labium, just passing beyond the extremities of the mandibles and maxillæ. The suture separating the eye-bearing piece from the antennary, mandibular, and maxillary pleurites and supra-clypeus, is distinct, the clypeus is now very distinct, and as large, seen laterally, as the supra-clypeus, though differing from it essentially in form.

The abdomen is now pointed at the extremity and divided into the rudiments of the two anal stylets, which form large acute tubercles. The yolk mass is now almost entirely enclosed within the body walls, forming an oval mass.

6. At this stage, the embryo is quite fully formed, and is about ready to leave the egg. The three regions of the body are now distinct. The articulations of the tergum are present, the yolk mass being completely enclosed by the dorsal walls. The ventral ganglia are fully formed and are seen laterally to be square, with the square ends opposed, though the commissures cannot be distinguished. More careful observation will undoubtedly reveal their presence. The body is so bent upon itself that the extremities of the second maxillæ just overlap the tip of the abdomen.

Fig. 4.




The embryo taken from the egg, but nearly ready to hatch. T, the dotted line crosses the main trachea, going through the yolk mass, now restricted to the thoracic region. At X, the tracheæ send off numerous branches around an enlargement of the intestine, where the blood is aerated; better seen in Fig. 5. The abdomen should be represented as consisting of eleven segments, the last being a minute triangular piece.

The front of the head is now still farther differentiated. The supra-clypeal piece seems to be merged in with the opthalmic ring, the sutures between them having disappeared. The insertion of the antennæ are removed higher up to just in front of the eyes, or rather the eyes have dropped down, as it were. The clypeus is broad and large, and the bilobate labrum is separated from it by a suture. The mandibles and maxillæ are still tubercular in shape, the teeth of the former not yet appearing. The two limbs of the labium are now placed side by side, with the prominent spinous appendage on the outer edges of the tip. These spines are the rudiments of the labial palpi.

The legs are long and bent partially back on themselves; at the angles partially articulated. The femoro-coxal joints are very distinct, the tarsi are directed upwards and the two claws are simple, straight, and equal in size. The tip of the abdomen ends in two unequal pairs of stylets, terminating in a long bristle. $6^{a}$ (Fig. 4.) The general form of the embryo at a still later period on being taken from the

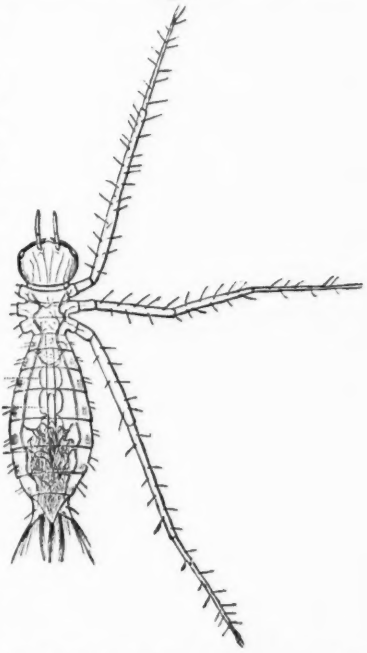
egg and straightened out, reminds us strikingly of the Thysanura, and shows quite conclusively that the Poduræ and Lepismæ, and allied genera, are embryonic forms of Neuroptera, and should therefore be considered a family of that suborder. Seen laterally, the body gradually tapers from the large head to the pointed extremity. The body is flattened from above downwards. At this stage the appendages are still closely appressed to the body.

7. This period occurs after the exclusion of the embryo, but the limbs are still laid along the body. They, however, with the mouth-parts, stand out freer from the body. The labium, especially, assumes a position at nearly right-angles to the body. The antennæ, mandibles, and maxillæ are now free, and have taken on a more definite form, being like that of the young larva, and stand out free from the body. The head is much smaller in proportion to the rest of the body, and bent more upon the breast.

Fig. 6.

The *pupa* of Diplax, in which the eyes are much larger, and the legs much shorter than in the recently hatched larva.

Fig. 5.




The *larva* just hatched and swimming in the water. N, ventral cord or nervous ganglia; D, dorsal vessel, or "heart," divided into its chambers. The anal valves at the end of the abdomen, which open and shut during respiration, are represented as being open. Both of the dotted lines cross one of the tracheæ. X, net-work of tracheæ.

8. *The Larva* (Fig. 5). The head is now free, and the antennæ stand out free from the front. The thorax has greatly diminished in size, while the abdomen has become wider, and the limbs very long; and the numerous minute tubercles seen in the preceding stage have given origin to hairs. The dorsal vessel can now, for the first time,

be seen. The resemblance when in motion to a spider is most striking. Fig. 6 represents the pupa of Diplax.

ESSEX INSTITUTE, March 4, 1867. — Mr. E. S. Morse spoke of the Cephalopods, and alluded to the many fallacious stories regarding the Cuttle-fish, citing Victor Hugo's description of the Devil-fish, in which the characters of two entirely different animals were mixed.

Vice-president Goodell called the attention of the meeting to the recent donation of one hundred and forty thousand dollars, by Mr. PEABODY, for the *Promotion of Science and Useful Knowledge in the County of Essex*, and read the letter and instrument of trust from Mr. Peabody, and the reply of the Trustees.

F. W. Putnam, Superintendent of the Museum, introduced the following Resolution: —

*Resolved*, — That the Institute has learned with feelings of gratitude and pleasure the fact of the munificent donation of $140,000 by George Peabody, Esq., for "the promotion, among the inhabitants of the County of Essex, of the study and knowledge of the Natural and Physical Sciences, and of their application to the Useful Arts;" and while, as citizens of this county, the members of the Institute are justly proud that this donation comes from a native of the county, they are most deeply sensible of the honor conferred upon their body by its being selected as the Institution with which the Trustees of this fund are to co-operate in securing the objects of the donor.

Dr. George B. Loring seconded the Resolution with appropriate remarks, and it was unanimously adopted.

A committee of seven members of the Institute was appointed to confer with the Trustees of the Peabody Fund in regard to the co-operation of the Institute.

MAY 8. *Annual Meeting.* — Reports of the officers were read; seventy-seven resident, and sixteen corresponding members have been elected during the year, and notices of the death of five resident, and four corresponding members have been received. Five field meetings, one social meeting, and the regular evening meetings, have been held during the year. A course of five lectures on zoölogy, by Mr. Morse, has been given by the Institute. The delay that has occurred in the publication of the Proceedings and Historical Collections, it is hoped, will not occur again, now that the Institute has established a printing office. It is believed that the establishment of Mr. Bicknell as a preparator of microscopical slides and similar work will prove instrumental in the promotion of some of the objects of the Institute. The total expenditure during the year was $2,491.41, receipts $2,521.33. Four thousand and eighty-six volumes, and parts of volumes, pamphlets, etc., were received during the year, from two hundred and nine contributors. Thirteen thousand specimens have been added to the Natural History Department, by two hundred and eighty-eight donations; and sixty-six donations have been made to the Historical Department. Over four hundred zoölogical specimens have been presented to other societies, and to individuals during the year.

# GLOSSARY.

*Abdomen.* Applied in insects and crustacea to the third or last region (hind-body) of the body.

*Acalephs* (Greek *acalephe*, stinging). A class of Radiated Animals, so called from their power of stinging and benumbing their prey.

*Acanthometra.* A genus of Rhizopods.

*Acarus.* The Mite (Cheese-mite, Itch-mite, etc.), a low degraded form of spider.

*Acer.* The Maple.

*Acetification.* The act of acetifying; the operation of making vinegar.

*Acnanthus.* A genus of Diatoms.

*Actinocrinus* (Gr. *actin*, a ray, and *crinos*, a lily). A genus of Crinoids.

*Æschna.* A genus of Dragon-flies.

*Agaricocrinus.* (From *Agaricus*, a mushroom, and *crinos*). The Mushroom-like Crinoid.

*Agnostus.* A genus of Trilobites.

*Agrion* (Gr. *agrios*, rural). A genus of small slender Dragon-flies.

*Alga* (pl. Algæ). The Sea-weeds; an order of cryptogamous plants, mostly inhabiting the ocean.

*Allosorus.** The Rock-brake; a species of fern.

*Alsine.* The Grove Sandworts; a genus of the Pink family.

*Amarantus.* The Amaranth.

*Amorphous.* Shapeless; without any definite form.

*Amphiprora.* A genus of Diatoms.

*Amphitetras.* A genus of Diatoms.

*Ampulex.* A genus of Sphegidæ or Sand Wasps.

*Ampullaria* (L. *ampulla*, bottle, jug). A genus of land shells.

*Andromeda.* Mythological name. A genus of the Heath family.

*Androspores.* The term applied to the zoöspore of algæ, which is developed into the dwarf male plant.

*Antenna* (L. a sail-yard). The first pair of feelers; the *palpi* being the second.

*Anthomyia* (Gr. *anthos*, flower, and *muzo*, to suck). A genus of flies (Diptera) frequenting flowers in the perfect state.

*Anthophorabia* (*Anthophora*, a wild bee, and *bio*, to live). A parasite of Anthophora, etc.

*Anthrax* (Gr. *anthrax*, coal). A genus of Diptera.

*Anthropoid.* Man-like; applied to the higher apes.

*Aphis* (Gr. *aphuo*, to drink in, to exhaust). A genus of Plant Lice.

*Arachnids* (Gr. *arachne*, a spider). The order of Spiders, Scorpions, Mites, etc.

*Arachnodiscus* (Gr. *arachne*, spider, *discos*, disk). A genus of Diatoms.

*Archæology.* The science of primitive or prehistoric man, describing the remains of the early races of men.

*Arctia* (Gr. *arctos*, a bear). A genus of moths, with very hairy larvæ, called "yellow bears."

*Arenaria.* The Sandwort; one of the Pink family.

*Argynnis.* A mythological name. A genus of butterflies.

*Ascalaphus.* A genus of Dragon-fly-like Hemerobiidæ, a neuropterous family.

*Asclepias.* The Silk-weed, Milk-weed, a genus of the Silk-weed family.

*Aspidium.* The Shield-fern, Wood-fern.

*Asterionella* (Diminutive of Aster, a little star). A genus of Diatoms.

*Asteromphalus* (Gr. *aster*, star, and *omphalos*, navel). A genus of Diatoms.

*Astrophytidæ.* A family of Ophiurans, containing the genus Astrophyton, the Medusa's head sand-star.

*Aurelia.* A genus of Jelly-fish.

*Aurochs.* The *Bison priscus*, the Lithuanian bull.

*Axil.* The angle formed by the stalk of a leaf with a stem, or by a branch with the stem.

*Bacillaria.* A genus of Diatoms.

*Bacillariæ* (L. *bacillum*, a rod or wand). A name originally applied to the Desmids and Diatoms collectively.

*Balsaminaceæ.* The botanical family of balsams.

*Benzöin.* A resinous substance exuding from the Styrax benzoe, or benzoin, a tree of Sumatra.

*Betulaceæ.* The botanical family of Birches.

*Biatora.* A genus of Lichens.

*Biddulphia.* A genus of Diatoms.

*Biology.* The Science of Life, embracing the habits and instincts, and development of organized beings.

*Blastoderm.* The primitive skin of the embryo.

*The derivations of botanical names are fully given in Gray's Manual of Botany.

*Blastodermic cells.* The cells forming the blastoderm.
*Bolina.* From the Latin, meaning a little ball. A genus of Acalephs.
*Bombycic acid.* An acid secreted by the Silk-worm, *Bombyx*, and allied genera.
*Bombycidæ.* From Bombyx; a family of moths.
*Botaurus* (Gr. *bos*, bull, *taurus*, bull). A genus of Herons.
*Botrychium.* A genus of Ferns.
*Bottosaurus.* A genus of fossil Crocodiles from the Cretaceous formation.
*Bouquetin.* The Wild Goat.
*Brachiopoda* (Gr. *brachion*, arm, and *pous*, foot). An order of Mollusca, so called from the arm-like fringe surrounding the mouth.
*Brachiospongia* (Gr. *brachion*, arm, spongia). A genus of fossil sponges.
*Bulbochæta* (L. *bulbus*, bulb, and *chaite*, a bristle). A genus of fresh-water algæ.

*Cabombaceæ.* The Water-shell family of plants.
*Cacalia.* The Indian Plantain.
*Caffeine.* A bitter substance in coffee.
*Calcareous.* Consisting of chalk or lime.
*Callitriche.* The Water-star wort, a genus of the river-weed family.
*Calluna.* A genus of the Heath family.
*Calopteryx* (Gr. *kalos*, beautiful, *pteron*, wing). A genus of Dragon-flies.
*Calypso.* Mythological name (botany).
*Cambrian.* A term applied in Great Britain to the lowermost strata of Silurian rocks.
*Campanula* (Italian *Campana*, a bell). The Bell-flower.
*Campylodiscus* (Gr. *campulos*, flexible, *diskos*, disk). A genus of Diatoms.
*Capsule.* A pod; any seed-vessel which splits open when dry.
*Carboniferous.* Belonging to the coal formation.
*Carcharodon* (Gr. *karcharos*, rough, *odon*, tooth). A genus of sharks.
*Carex*, pl. *carices.* A sedge. A genus of the Sedge family.
*Centaurea.* The Star-thistle; one of the composite family.
*Centurus.* A genus of Woodpeckers.
*Cephalopoda* (Gr. *kephale*, head, *pous*, foot). The Cuttle-fishes, Squids, etc. A class of Mollusca.
*Cephalothorax.* The head-thorax or anterior region of the body of the Crabs; also usually applied to the similar part in spiders.
*Ceratites* (Gr. *ceras*, a horn). A fossil cephalopod.
*Cerebral.* Relating to the brain.
*Cerebellum.* One of the divisions of the brain, situated at the base of the skull.
*Ceresa.* A genus of hemipterous insects.
*Cermatia* (Gr. *kerma*, composed of segments). A genus of Myriapods.
*Cestoids* (Cestoidea, Gr. *kestos*, a band, *eidos*, form). A group of parasitic worms.
*Chalcid.* Relating to the hymenopterous family Chalcididæ.
*Chelonian.* Relating to the Chelonians, or turtles.
*Chenopodium.* Goose-foot, Pig-weed; a genus of the Goose-foot family.
*Chionobas* (Gr. *chion*, snow, *bio*, to live). A genus of arctic butterflies.
*Chloeön.* A genus of the neuropterous family, Ephemeridæ.
*Chrysalis.* The pupa, or second stage in the transformation of insects.
*Chrysopa* (Gr. *chrusopes*, golden). The Golden-eyed, lace-winged fly. A genus of the Neuropterous family Hemerobiidæ.
*Chrysophanus* (Gr. *chrusos*, golden, and *phaneo*, to appear). A genus of butterflies.
*Cicindela.* The Tiger-beetle. A genus of the Coleopterous family Cicindelidæ.
*Cimex.* The Bed-bug. A genus of the Hemipterous family, Cimicidæ.
*Circes*, pl. of *Cercis.* The Judas-tree; Red-bud. A genus of the Pulse family.
*Cladoniæ*, pl. of *Cladonia.* The Reindeer moss.
*Closterium.* A genus of Desmids.
*Clypeus.* The piece lying in front of the eyes, and next the labrum.
*Coagulum.* A clot.
*Cocconema.* A genus of Diatoms.
*Cœanothus.* The New Jersey tea; Redwood. A genus of the Buckthorn family.
*Cœlabogyne.* A genus of the Spurge family.
*Coleoptera* (Gr. *koleos*, sheath, *pteron*, wing). The Beetles. So called from the upper wings being thickened, and covering or ensheathing the under membranous pair.
*Colymbitæ.* The family of Divers and Loons.
*Comandra.* The bastard Toad-flax. A genus of the Sandal-wood family.
*Comatula* (L. *comatus*). A genus of living Crinoids.
*Condyle.* The knuckle; a protuberance in a bone at its extremity.
*Conferval, conferroid.* Relating to Confervæ; a group of algæ, or sea-weeds.
*Conifers.* The Pines, or cone-bearing plants.
*Conocephalites* (Gr. *conos*, cone, *cephale*, head). A genus of Trilobites.
*Conularia* (L. *conulus*, a little cone). A genus of Pteropod shells.
*Conulus* (L. diminutive of *conus*, a cone). A genus of Land-snails.
*Coracoïd.* A process of the blade-bone, shaped like a crow's beak.
*Corolla.* The leaves of the flower within the calyx.
*Corrugated.* Wrinkled.
*Coryne.* A genus of Acalephs.
*Coscinodiscus* (Gr. *koskinon*, a sieve, *diskos*, disk). A genus of Diatoms.
*Corydalus.* (Gr. *korydalos*, Alauda cris-

tata). A genus of the Hemerobius family of Neuroptera.

*Cotyledon.* Seed-leaf. The seminal leaf of a plant.

*Crabronidæ.* The Hymenopterous family of Sand and Wood-wasps.

*Craspedodiscus* (Gr. *kraspedon*, edge, limb, *discos*, disk). A genus of Diatoms.

*Cretaceous.* The name of the chalk formation or geological period.

*Crinoidal.* Relating to Crinoidea (Gr. *krinos*).

*Crustacea.* The class of articulata comprising the crab, lobster, beach-flea, etc.

*Cryptogamia* (from the Greek, meaning "hidden fructification"). Flowerless plants, not bearing real blossoms or true seeds (*i.e.*, with an embryo ready-formed within.

*Cryptogamous.* Relating to the *Cryptogamia.*

*Culm.* A straw. The stem of grasses and sedges.

*Cupuliferæ.* The Oak-family.

*Cuscuta.* The Dodder. A genus of the Convolvulus family.

*Cyathocrinus* (Gr. *cuathos*, cup, *krinos*, lily). A genus of Crinoidea.

*Cyathophylloid*, like *Cyathophyllus.* A genus of fossil corals, shaped like a *cyathus*, or cup.

*Cycads* (*cycas*). A genus of trees intermediate between the palm and the ferns.

*Cyclosis.* The circulation in closed cells of plants.

*Cyclotella* (Gr. diminutive of *kuklos*). A genus of Diatoms.

*Cynocephalus.* The dog-faced Baboon; one of the anthropoid apes.

*Cynomys* (Gr. *kunon*, dog, *mus*, mouse). A genus of squirrels.

*Cynthia.* Mythological name. A genus of butterflies.

*Cyperaceæ.* The Sedge family.

*Cypridina.* A genus of Entomostraca; a group of small Crustacea, called water-fleas, etc.

*Cystidians* (Gr. *kustis*, sac, bladder, *idios*, like). A group of fossil Echinoderms.

*Deciduous.* Falling off; said of leaves which fall in autumn.

*Delphax.* A genus of the Hemipterous family Cercopidæ.

*Dendritic.* Tree-like in form.

*Devonian.* One of the older geological formations; the Old-Red Sandstone.

*Dextrine.* The gummy matter into which the interior substance of starch globules is converted by certain acids, etc.

*Diatomaceæ* (Gr. *dia-temno*, to cut in two). The group of silicious-shelled algæ.

*Dichogamy.* See p. 404.

*Dichotomous.* Two-forked.

*Didelphys* (Gr. *dis*, double, *delphus*, uterus). The Opossum. A genus of marsupials.

*Dimorphism.* When a part, or an animal itself takes on two forms; or a mineral crystallizes in two forms.

*Dinichthys.* A genus of gigantic extinct [fish.

*Diœcious* or *Dioicous.* When the stamens and pistils are in separate flowers, on different plants.

*Diplax* (Gr. *dis*, two, *plax*, surface). A genus of Dragon-flies.

*Diplolepis* (Gr. *diploös*, double, *lepis*, scale). A genus of Hymenopterous Gall-flies.

*Diptera* (Gr. *dis*, two, *pteron*, wing). The two-winged insects, like the Musquito and House-fly.

*Discoid.* Like a disc.

*Dycotyledonous.* Having a pair of cotyledons.

*Echinoderms* (Gr. *Echinus*, sea-hedgehog, *derma*, skin). A class of Radiata.

*Elephas.* The genus of Elephants.

*Embryology.* The science relating to the development of animals.

*Empetrum.* The Black Crowberry.

*Empidonax.* The Fly-catcher; a genus of birds.

*Encrinites.* The stalks of Crinoidea.

*Encyonema* (Gr. *egkuos*, gravid, swelling, *nema*, thread). A genus of Diatoms.

*Entomostraca* (Gr. *Entomon*, insect, *ostracon*, shell). An order of Crustacea, containing the Water-fleas, etc.

*Entozoön, Entozoa* (Gr. *entos*, within, *zoön*, animal). A group of internal parasitic worms.

*Eocene* (Gr. *eos*, morning, *kainos*, recent). The first of the three subdivisions of the tertiary epoch.

*Eozoön* (*Eos*, early, *zoön*, animal). The first created animal yet known. A genus of Foraminifera.

*Ephyra.* The young of Jelly-fishes, such as Aurelia.

*Epidermis.* The skin.

*Ephemera.* The May-fly; a neuropterous genus.

*Ephemeridæ.* The neuropterous family, represented by the genus Ephemera.

*Epimerum.* The side-piece of a thoracic ring, and situated behind the episternum of insects.

*Episternum* (*Epi*, upon, *sternum*, breast-piece). A piece in a thoracic ring lying next to the sternum, and usually in front of the epimerum.

*Epiphysis.* Any portion of a bone separated from the body of a bone by a cartilage, which becomes converted into bone by age.

*Erigeron.* The Flea-bane; a composite flower.

*Euastrum* (Gr. *Eu*, beautiful, *aster*, star). A genus of Desmids.

*Eucope.* A small Jelly-fish.

*Eumenes* (Gr. *Eumenes*, benevolent). A genus of Wasps.

*Eunotia* (*Eu*, beautiful, *notos*, back). A genus of Diatoms.
*Eupodiscus*. A genus of Diatoms.
*Euphorbia*. The Spurge Plant.
*Eurylepis* (Gr. *euros*, broad, *lepis*, scale). A genus of Fishes.
*Eurypteridæ* (Gr. *euros*, broad, *pteron*, wing). The family of which Eurypteris is the type.
*Euscelosaurus*. A genus of fossil reptiles.

*Fascicle*. A close cluster.
*Fauna*. An assemblage of animals peopling a certain country. We also speak of the Bird-fauna, or Insect-fauna of a country.
*Favositidæ*. The family of corals represented by the genus Favosites.
*Femur*. The thigh bone.
*Ferrous*. Relating to iron.
*Fibrine*. Belonging to the fibres of plants.
*Fibula*. The long bone by the side of the tibia.
*Filamentous*. Like a hair or filament.
*Flabellaria*. From *flabellum*, a little fan.
*Flora*. An assemblage of plants belonging to a certain country. We also speak of a Phanerogamous or Cryptogamous flora.
*Fœtus*. The young of any animal in the womb.
*Foraminifera*. The shell-making Rhizopods.
*Forbesiocrinus* (Forbes, *krinos*, lily). A genus of Crinoids, named in honor of Edward Forbes.
*Fumaroles*. A hole in a volcano from which smoke issues.
*Fusiform*. Spindle-shaped.

*Ganoid*. Relating to the ganoid fishes, distinguished by angular scales.
*Gavials*. A genus of Crocodiles.
*Gemmiparous*. Growing by buds, as in polyps.
*Gentianaceæ*. The Gentian family.
*Geraniaceæ*. The Geranium family.
*Gerris*. The Water-skater; a homopterous genus.
*Gibbous*. Swollen.
*Globigerina*. A genus of Foraminifera; the shells consisting of numerous globular chambers.
*Gomphonema* (Gr. *gomphas*, wedge, *nema*, a thread). A genus of Diatoms.
*Grammatophora* (Gr. *gramma*, writing, *phoreo*, to bear). A genus of Diatoms.
*Grapta* (Gr. *grapho*, to write). A genus of Butterflies.
*Grallatorial*. Relating to the Grallatores, or Wading-birds.
*Graphitic*. Relating to Graphite, plumbago.
*Gregarina*. A microscopic genus of Entozoa.
*Grossulariaceæ*. The Currant family.
*Gymnadenia*. The Naked-gland Orchis.
*Gynandrosporous*. See p. 526.
*Gypona*. A genus of the Hemipterous family Cercopidæ.

*Habenaria*. A genus of Orchids.
*Halesidota*, Halysidota (Gr. *halusidotos*, chain). A genus of the Lepidopterous family Bombycidæ.
*Haliotidæ* (Gr. *halios*, marine, *ous*, ear, sea-ear). The Molluscan family, so named from the genus Haliotis.
*Helenium*. The false Sunflower. A genus of composite flowers.
*Heliolites* (Gr. *helios*, sun). A genus of fossil corals.
*Helminthosporium* (Gr. *helmins*, worm, *spora*, seed). A genus of Fungi.
*Hematite*. A variety of native oxide of iron.
*Hemeristia* (Gr. *hemera*, day). A genus of fossil neuropteras, allied to Corydalus.
*Hemerobina* (Hemerobiidæ). A neuropterous family named from the typical genus Hemerobius.
*Hemiptera* (Gr. *hemi*, half, *pteron*, wing). The sub-order of bugs, including the Cicada, etc.
*Hippurites* (Gr. *hippos*, horse, *oura*, tail). A genus of fossil shells.
*Hirundo*. The Swallow.
*Holothurians* (Gr. *holothouria*). An order of Echinoderms.
*Homoptera* (*homos*, similar, *pteron*, wing). A subdivision of the Hemiptera.
*Honkenya*. The Sea-sandwort. A genus of the Pink family.
*Humerus*. The thigh-bone.
*Hyaline*. Transparent.
*Hyalodiscus* (Gr. *hualos*, hyaline, *discos*, disk). A genus of Diatoms.
*Hydroids* (Hydra-like). An order of Acalephs.
*Hymenoptera* (Gr. *humen*, membrane, *pteron*, wing). The membranous-winged insects; bees, wasps, ants, etc.
*Hyphantria* (Gr. *huphantria*, a weaver). A genus of the Moth family Bombycidæ.

*Ianthina* (Gr. *Ianthinos*, violet-colored). A genus of pelagic mollusca.
*Ibex*. A genus of Goats.
*Icteridæ*. The Blackbird family.
*Idyia*. A genus of Acalephs.
*Iguanodon* (Spanish *Iguana*, Gr. *odon*, tooth). A genus of reptiles.
*Ilex*. The Holly.
*Ilium*. One of the bones of the pelvis.
*Imago*. The perfect state of insects, in distinction from the larva or pupa state.
*Impatiens*. The Balsam, Jewell-weed.
*Incrassated*. Thickened.
*Infusoria*. Protozoa and other microscopic animals and plants generated in infusions of plants; commonly called *animalcules*.
*Isöetes*. Quillwort; an aquatic cryptogam.

*Issus.* A genus of the hemipterous family Cercopidæ.

*Jatropha.* The Spurge-nettle.
*Juncus*, pl. *Junci.* The Rush.
*Jurassic.* A geological formation.

*Kjœkkenmœddings*, pronounced Kirk-ken-mer-dings. From the Danish; meaning kitchen-refuse.

*Labium.* The second pair of maxillæ of insects, consolidated into the piece forming the under lip of insects, and opposed to the labrum, or upper lip.
*Lacustrine.* Relating to a lake.
*Lamna.* A genus of Sharks.
*Larva.* The first stage of the young insect after hatching.
*Lasiurus* (Gr. *lasios*, hairy, *oura*, tail). A genus of Bats.
*Laurentian.* A geological formation, the oldest known, so-called from the St. Lawrence river.
*Lemna.* The Duck-weed.
*Lepidoptera* (Gr. *lepis*, scale, *pteron*, wing, scaly-winged). A suborder of insects; the butterflies and moths.
*Leporides.* The Hares.
*Leptorine.* Relating to the hares.
*Lesleyite.* A mineral named after Lesley.
*Lespedeza.* The Bush-clover.
*Lestes.* A genus of small Dragon-flies.
*Libellula* (L. *libella*, a little book). The Dragon-fly.
*Licmophora.* A genus of Diatoms.
*Liliaceæ.* The Lily family.
*Limacodes* (Gr. *limacodes*, herb-feeding). A genus of Bombycidæ, whose larva is slug-like.
*Limnæa.* A genus of fresh-water snails.
*Limnanthaceæ.* The Limnanthus family.
*Linaria.* The Wood-flax; a genus of the Fig-wort family.
*Lindera.* The Benzoin bush.
*Lingual.* Relating to the tongue.
*Lingula* (L. diminutive of *Lingua*, tongue). A genus of brachiopod shells. Also the name of a sub-formation of the Lower Silurian formation.
*Linum.* The Flax.
*Liriodendron.* The Tulip-tree.
*Littorina* (L. *Littus*, relating to the shore). A genus of Shells.
*Lizzia.* A genus of Acalephs.
*Lobiform.* Pad-like.
*Loganiaceæ.* Logania family of plants.
*Lophobranchs.* A group of fishes, embracing the Sea-horse, Pipe-fish, etc.
*Lunule.* A crescent-shaped area.
*Lupus.* The Wolf.
*Lycæna* (Gr. *lukaina*, she-wolf). A genus of butterflies.
*Lycopods.* The Club-mosses.
*Lysianassa.* A genus of "Beach-flea," Amphipod Crustacea.

*Macropus* (Gr. *macros*, large, *pous*, foot).
*Macrosaurus* (Gr. *macros*, large, *saurus*, reptile). A gigantic fossil Crocodile.
*Mandible.* The biting, chewing "jaws," or first pair of jaws of insects, corresponding to the jaw and teeth of vertebrate animals.
*Mantispadæ.* The Orthopterous family, so named from the typical genus Mantis, the Sooth-sayer insect.
*Marsupials.* The Pouched Mammals.
*Maruta.* The May-weed; a genus of the Composite family.
*Matrix.* A mould; the rock in which minerals are imbedded.
*Maxilla.* The lower jaw, applied also to the second pair of jaws of insects.
*Medicago.* The Medick. A genus of the Pulse family.
*Medullary.* Relating to the spinal marrow, or spinal cord.
*Medusæ.* The Jelly-fishes.
*Megalichthys* (Gr. *megas*, large, *ichthus*, fish). A reptile-like fish.
*Megalosaurus* (Gr. *megas*, large, *sauros*, reptile). A gigantic fossil reptile.
*Megatherium* (Gr. *megas*, large, *therion*, animal). A gigantic Sloth-like animal.
*Melanerpes* (Gr. *melas*, black, *herpes*, creeping). A genus of Woodpeckers.
*Melanthaceæ.* The Colchicum family.
*Melecta* (Gr. *meli*, honey, *lego*, to choose). A genus of Bees.
*Melitæa.* A genus of Butterflies.
*Melosira.* A genus of Diatoms.
*Menobranchus* (Gr. *menos*, strength, *bragchos*, gill). A genus of gilled salamanders.
*Menopoma* (Gr. *menos*, *poma*, operculum, door). A genus of Salamanders.
*Mesozoic* (Gr. *mesos*, middle, *zoön*, animal). The middle division of geological formations, the *Palæozoic* being the oldest, and the *Cainozoic* the most recent group of geological periods.
*Metamorphic.* Relating to crystalline rocks altered from Sandstone, etc.
*Metatarsal.* Relating to the metatarsus, or bone of the instep, lying between the toes and tarsus, or heel.
*Micrasterias* (Gr. *micros*, small, *aster*, star). A genus of Desmids.
*Millepora* (L. *mille*, thousand, *porus*, pore, hole). A genus of Corals.
*Miocene* (Gr. *meion*, less, *kainos*, recent). The second division of the Tertiary epoch.
*Modiola.* The Horse-mussel.
*Mollusca.* From *mollis*, soft. The branch or sub-kingdom of Shell-fish, etc.
*Monochromatic.* Having but one color.
*Monœcious.* Having stamens or pistils only.
*Monopetalous.* When the corolla is composed of but one piece.
*Morphology.* The study of typical forms.
*Mucedineæ.* A group of minute fungi, moulds.
*Mucor.* A genus of minute fungi, or mould.
*Multipartite.* With many partitions.
*Muscidæ.* A family of Diptera, so called from the typical genus Musca.

*Mycelial.* Relating to the filaments from which mushrooms, etc., grow.
*Mycetophilidæ.* A family of Diptera, so called from the genus Mycetophila.
*Myriapoda* (Gr. *murios*, thousand, *pous*, foot). An order of Insects; the Centipedes, Galley-worms, Thousand-legs, etc.
*Myrmica* (Gr. *murmex*, ant). A genus of Ants.

*Nareda.* A genus of Nemertean worms: one of the smooth round worms.
*Narthecium.* The Bog-asphodel; a genus of the Lily family.
*Nardosmia.* Sweet Coltsfoot; a genus of the Composite family.
*Nassa.* A genus of Sea-shells.
*Natatorial.* Noting a Swimming-bird.
*Natica.* A genus of Sea-shells.
*Navicula* (L. diminutive of *naris*, a ship). A genus of Diatoms.
*Neocæsariensis.* Relating to New Jersey.
*Nemertean*, Nematoid. Relating to *nemertes*, a smooth round worm, lower than, but allied to the Earth-worm.
*Nephroma.* A genus of Plants.
*Nereis.* A Sea-nymph; a genus of worms.
*Neuroptera* (Gr. *neuron*, nerve, *pteron*, wing). The veiny-winged insects; Dragon-flies, Ephemera, etc.
*Nitschia.* A genus of Diatoms.
*Noctilucæ* (Gr. *nux*, night, *lu-kæ*, light). A genus of phosphorescent protozoa.
*Noctuidæ.* A family of Moths; from the typical genus *Noctua*.
*Notonecta* (Gr. *notos*, back, *nektos*, swimming. A genus of aquatic Hemipters, which swim on their back.
*Notodontidæ.* A group of Moths belonging to the Bombycidæ.
*Notommata.* A genus of Rotifera.
*Nymphæaceæ.* The family of Water-lilies.
*Nyssonidæ* (Gr. *nusso*, to sting). A family of Wasps, so called from the typical genus *Nysson*.

*Œdogonium.* A genus of Confervæ.
*Oldenlandia.* The Houstonia, Innocence, Bluets. A genus of the Madder family.
*Onagraceæ.* The Evening Primrose family.
*Onoclea.* The Sensitive Fern.
*Operculum* (L. a door). The horny piece filling up the aperture of the shell after the animal has withdrawn.
*Ophiuridæ.* The Sand-stars; a family of Echinoderms.
*Ophrys.* An orchid.
*Opthalmic.* Relating to the eye.
*Orbulina* (L. diminutive of *Orbs*, a sphere). A genus of Foraminiferous shells.
*Orobanche.* The Squaw-root, the Cancer-root. A genus of the Broomrape family.
*Orthis* (Gr. *orthis*, straight). A genus of fossil Brachiopod shells.
*Orthoptera* (Gr. *orthis*, straight, *pteron*, wing). The straight-winged Insects. The Grasshoppers, etc.
*Osmia* (Gr. *osme*, odor). The Mason-bee.
*Osmosis.* The passage of fluids through membranes.
*Otodus.* A genus of Fishes.
*Oxalis.* The Wood-sorrel; a genus of the Oxalidaceæ, or Wood-sorrel family.

*Pabulum* (L. for food).
*Pachydermata* (Gr. *pachus*, thick, *derma*, skin). The thick-skinned mammals, Elephants, swine, etc.
*Palæontologist.* The student of fossils.
*Palæozoic* (Gr. *palaios*, ancient, *zoön*, animal-life). Applied to the oldest Fossiliferous rocks.
*Palæoniscus.* A genus of Fossil fishes.
*Palimpsest.* Parchment from which one writing has been erased to make room for another.
*Paludina* (L. *palus*, a swamp). A genus of fresh-water Shells.
*Panorpina* (Panorpidæ). A neuropterous family; so named from the typical genus Panorpa.
*Paradoxides* (Gr. *paradoxos*, paradoxical). One of the oldest genera of Trilobites.
*Parenchyma.* The soft cellular tissue of plants, like the green pulp of leaves.
*Parnassiaceæ.* The Parnassia family of plants.
*Passiflora.* The Passion-flower.
*Patersonite.* A mineral named after Paterson, a mineralogist.
*Pathological.* Relating to diseased parts of animals.
*Paullinia.* The Guarana plant.
*Pecopteris.* A genus of Ferns.
*Pediculus.* The Louse; a genus of bugs, Hemiptera.
*Pelage.* Fur, hair, skin of a wild beast.
*Pellæa.* The Cliff-brake.
*Pelopœus.* A genus of Mud-wasps.
*Penicillium.* A genus of microscopic Fungi.
*Pentacrinus* (Gr. *pentas*, five, *crinos*. A genus of Crinoids.
*Pentandrous.* Having five stamens.
*Penthorum.* Ditch-stone crop. A genus of the Saxifrage family.
*Pentremites.* A genus of Crinoids.
*Periphery.* The circumference of a circle.
*Peripheral.* Relating to Periphery.
*Perlina* (Perlidæ). A family of Neuroptera.
*Permian.* The name of a geological formation.
*Petaloid.* Petal-like.
*Phænogamous.* Relating to the Phanerogams, or Flowering-plants.
*Phalanges.* The Finger-bones.
*Philampelus.* A genus of Hawk-moths.
*Phleum.* A genus of Grasses.

*Phymata* (Gr. *phumatoo*, to swell). A genus of Hemiptera.
*Phytocoris* (Gr. *phuton*, plant, *koris*, bug), A genus of Hemiptera.
*Physa.* A genus of Fresh-water Snails.
*Picus.* A genus of Woodpeckers.
*Pieris.* A genus of Butterflies.
*Pinus.* The Pine-tree.
*Pianularia* (L. diminutive of *pinna*, a wing). A genus of Diatoms.
*Pisum.* The Pea.
*Placental.* Relating to the placenta.
*Platanthera.* The False-orchis; a genus of the Orchis family.
*Platycrinus* (Gr. *platus*, broad, *krinos*, lily). A genus of Crinoids.
*Pleurobrachia* (Gr. *pleuros*, many, *brachion*, arm.) A genus of Jelly-fishes.
*Pleistocene* (Gr. *pleistos*, most, *kainos*, new). The newest strata of the Tertiary, or beginning of the present or Historic period. The Quarternary Epoch.
*Pliocene* (Gr. *pleion*, more, *kainos*, new). The newer tertiary, or third subdivision of the Tertiary.
*Pleurosigma.* A genus of Diatoms.
*Plumule.* The little bud, or first shoot of a germinating plantlet above the Cotyledons.
*Pocillipora.* A genus of Corals.
*Podophyllum.* The May-apple, Mandrake. A genus of the Barberry family.
*Podosira.* A genus of Diatoms.
*Polemonium.* The Greek Valerian.
*Poliopti'a.* A genus of Fly-catchers.
*Polycystina* (Gr. *polus*, many, *custis*, cyst, sac). Minute rhizopods bearing a silicious shell, ornamented with spines.
*Polygamous.* Having some perfect and some separated flowers, on the same or on different individuals, as the Red Maple.
*Polypes*, Polyps (Gr. *Polypus*). The Sea-anemonies, etc.; a class of Radiate animals.
*Polypodium.* A Fern. Polypody.
*Polyzoön* (Gr. *polus*, many, *zoön*, animal). A class of Mollusca.
*Pompilus.* A genus of Sand-wasps.
*Porites.* A genus of Corals.
*Portulaceous.* Relating to Portulaca. The Purslane.
*Potamogeton.* The Pond-weed.
*Primordial.* Earliest.
*Prodrome.* Forerunner.
*Productus.* A genus of fossil Brachiopods.
*Pronated*, Pronation. To turn the palm downward.
*Protoplasm.* The soft nitrogenous lining or contents of cells.
*Protozoa* (Gr. *protos*, first, *zoön*, animal). The simplest form of animal life, forming the fifth sub-kingdom of animals. The Sponge, Amœba.
*Psocina*, Psocidæ. The Neuropterous family, so called from Psocus.
*Pteromali*, Pteromalus. A genus of Chalcids.
*Pteropods* (Gr. *pteron*, wing, *pous*, feet). A group of pelagic gasteropodous mollusca, moving by wing-like expansions placed near the head.
*Pulmonates.* Breathing by lungs; applied to the air-breathing Snails.
*Pupa.* The Chrysalis, aurelia, or second stage in the transformation of insects.
*Putorius.* The Weasel.
*Pulvinulina.* A genus of Foraminifera.
*Pyrrharctia* (Gr. *pyrrhus*, red, *arctia*). A genus of Bombycidæ.
*Pyrula.* A genus of gasteropod shells.

*Quarternary.* The latest, or post-tertiary geological period, merging into the historic period.
*Quercus.* The genus of Oaks.

*Racemes.* A flower cluster, with one-flowered pedicels along the sides of a general peduncle, or stem.
*Radicle.* The stem part of the embryo, the lower end of which forms the root.
*Ranatra* (Gr. *ranter*, waterman). A genus of aquatic hemiptera.
*Raphanus.* The Radish.
*Reduvius.* A genus of Hemipterous insects.
*Reticulation.* Net-work.
*Rhizodus* (Gr. *rhiza*, root, *odos*, tooth). A genus of fossil fishes.
*Rhombic.* Like a rhomb.
*Rotifera* (L. *rota*, wheel, *fero*, to bear). The Wheel-animalcules; a group referred to the Crustacea, and also the Worms.
*Rubiaceæ.* The Madder family.

*Sarcode* (Gr. *sarx*, flesh, *derma*, skin). The jelly-like substance composing the bodies of Protozoa, corresponding to the flesh of the higher animals.
*Sarcolemma.* The sheath enveloping the muscular fibrillæ (little fibres).
*Scapiocrinus.* A genus of Crinoids.
*Scelidosaurus.* A fossil reptile.
*Scoliidæ.* A family of Wasps, so called from *Scolia*, the typical genus.
*Scoria.* Volcanic cinders.
*Secondaries.* Applied to the hind or second pair of wings of Lepidoptera.
*Selandria.* The Saw-fly; a genus of the Hymenopterous family Tenthredinidæ.
*Selenosporium.* A genus of minute fungi.
*Semipalmated.* Partially webbed.
*Septum.* A division.
*Sequoia.* The Redwood; a genus of Pines.
*Seriolaria.* A genus of Polyzoa.
*Sialidæ*, Sialina. A Neuropterous family, from Sialis, the typical genus.
*Sigmoid.* Like the letter S.
*Silurian*, from Silures; a race of ancient Welsh; applied to a geological formation.
*Skier.* A small island, islet.
*Spat.* The spawn of shell-fish.
*Spermatozoa*, Spermatozoid. The male germ.
*Sphingidæ.* The family of Hawk-moths, from the genus Sphinx.

*Sphegidæ.* The family of Sand-wasps; from the genus Sphex.
*Sphyrapici.* A group of Woodpeckers.
*Sphyræna.* A genus of Fishes.
*Spirifer* (L. *spira*, spire, *fero*, to bear). A genus of fossil Brachiopod shells.
*Spiracles.* The breathing-holes of insects, through which air is conveyed into the body.
*Sporangium.* Spore-case.
*Spore.* The seed of Ferns, Mosses.
*Sporular.* Relating to a spore or sporule; a small spore.
*Stauroneis* (Gr. *stauros*, a cross, *neis*, a little boat). A genus of Diatoms.
*Stelis.* A genus of wild bees.
*Sternite.* The ventral piece forming the lower arch of the segment of an insect.
*Stylet.* A spine-like process, usually ending in a bristle.
*Stylops.* A genus of parasitic Beetles.
*Supinate.* To raise the palm upwards.
*Surirella.* A genus of Diatoms.
*Syenite.* Like granite, except that it contains hornblende instead of mica, as one of its three constituents.
*Synchronize.* To refer to the same age.
*Synchronous.* Of the same age.
*Synedra.* A genus of Diatoms.
*Synthetic.* Comprehensive; see p. 270.

*Tabulate.* Having a vertical row of plates.
*Tachina.* A genus of parasitic flies, like the House-fly.
*Tarsus.* The toe; in insects the terminal joint of the leg, divided into from two to five joints.
*Tellurium.* A metal.
*Terebella.* A genus of marine worms.
*Terebratula* (L. *terebra*, a gimblet). A genus of brachiopods.
*Tergum.* The "back" of insects; the upper part of the insect segment.
*Tetrabranchiata.* An order of Cephalopodous mollusca, such as the Nautilus, Ammonite, etc.
*Tettigonia* (Gr. *tettix*, cicida). A genus of Hemipterous insects.
*Thalassicola* (Gr. Sea-dweller). A group of gelatinous protozoa found floating in the sea.
*Thecla.* A genus of Butterflies.
*Thomomys* (Gr. *thomos*, heap, *mus*, mouse). A genus of Mice.
*Thoracosaurus.* A genus of fossil reptiles.
*Tibia.* The Shank-bone.
*Tipulidæ.* A Dipterous family; Daddy-long-legs.
*Triassic.* Relating to the Trias, or New-Red Sandstone formation.
*Tricceratium* (Gr. *trias*, three, *keras*, horn). A genus of Diatoms.
*Trilliaceæ.* The Trillium family.
*Trilobites.* A group of extinct Crustacea allied to the Horse-shoe Crab, Limulus.
*Trisetum.* A genus of Grasses.
*Tritonium* (Gr. *triton*). A genus of marine shells.

*Ulna.* The larger and inner of the two bones of the fore-arm.
*Umbels.* An umbrella-like bunch of flowers.
*Unionidæ.* The Naiades; a family of fresh-water Mussels.
*Urite.* The abdominal sternum; (sternite.)
*Utricle.* A small, thin-walled, one-seeded fruit, as of Goosefoot.

*Vascular.* Relating to the blood-vessels.
*Vesicular.* Containing vesicles or cells.
*Vespa.* The Paper-wasp; a genus of the Vespidæ.
*Vespertilio* (L. *vesper*, evening). The Bat. A genus of the family Vespertilionidæ.
*Vicia.* The Vetch, Tare; a genus of the Pulse family.
*Viola.* The Violet.
*Vitis.* The Grape-vine.
*Vitrina* (L. *vitrea*, glassy). A genus of Land Snails.
*Volvox* (L. *volvo*). A genus of microscopic plants.
*Vorticella* (L. *vortex*). A genus of Protozoa.

*Wolffia.* A genus of the Duckweed family.

*Xanthidium* (*xanthion*, a burr). A genus of Desmids.
*Xiphosura.* A group of fossil Crustacea, allied to the Horse-shoe Crab.
*Xylophagous.* Wood-devouring.

*Zeacrinus.* A genus of Crinoids.
*Zeolitic.* Relating to the Zeolite family of minerals.
*Zonites.* A genus of fossil Land Snails.
*Zoöspore* (Gr. *zoön*, animal, *sporos*, seed). The male germ, or embryo of microscopic plants. See p. 221.

# INDEX TO VOLUME ONE.